STUDY OF THE PATTERN OF SUPERFICIAL DERMATOPHYTIC INFECTIONS OF THE SKIN

Dissertation

Submitted to

THE TAMILNADU Dr. M.G.R MEDICAL UNIVERSITY

In partial fulfilment of the requirements for the award of the degree of

M.D DERMATOLOGY, VENEREOLOGY & LEPROSY

Branch XX

APRIL 2017

CERTIFICATE

This is to certify that this dissertation entitled **"Study of the Pattern of Superficial Dermatophytic Infections of the Skin"** is a bonafide record of the work done by **Dr. Arishta Bala** under guidance and supervision in the Department of Dermatology, Venereology & Leprosy during the period of her postgraduate study for **M.D Dermatology, Venereology & Leprosy. [Branch-XX]** from 2014-2017.

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DECLARATION

In the following pages is presented a consolidated report of the study **"Study of the Pattern of Superficial Dermatophytic Infections of the Skin."** A cross sectional study on cases studied by me at Sree Mookambika Institute of Medical Sciences, Kulasekharam from 2015-2016. This thesis is submitted to the Dr. M.G.R. Medical University, Chennai in partial fulfilment of the rules and regulations for the award of MD Degree examination in Dermatology, Venereology & Leprosy.

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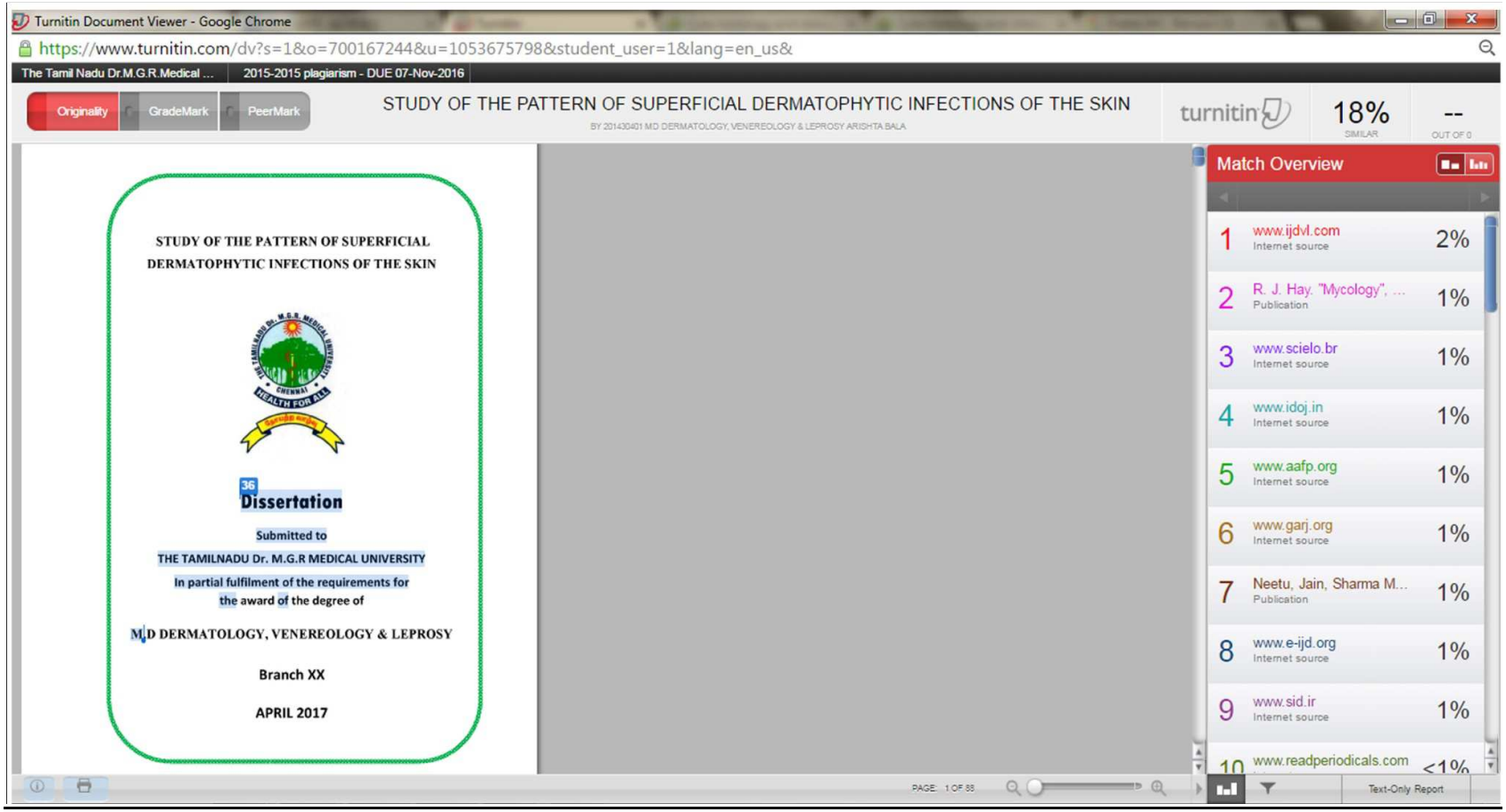
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I am grateful to my family members for relieving me of my social responsibilities so that I could fully focus my attention on this study.

Without the whole hearted cooperation of my patients, this thesis would not have reached a conclusion. I express my sincere gratitude to all my patients at Sree Mookambika Institute of Medical Sciences, Kulasekharam.

Dr. Arishta Bala

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Introduction

INTRODUCTION

Dermatophytosis is still a general public health problem.[1-3] The dermatophytes are the most common fungal infections of the skin as they affect majority of the population and their prevalence is high worldwide.[4]

Dermatophytes include a group of fungal infections which affect the keratinised tissue of the body (skin, hair and nail).[5] Dermatophytes affect the stratum corneum of the epidermis. In worldwide superficial mycosis appears to be the most common mycotic infection. At least 10% of world's population has dermatophytic infection.[2] The prevalence of superficial fungal infections in different parts of world is related to environmental factors such as climate, geographical location, life style, involvement of outdoor activities and socio economic conditions.[6] A higher incidence was reported in males in India. Clinical presentation varies with species, strain, size of inoculum, sites affected and immune status of the individual (Host response).[7] Overcrowding, poverty and poor personal hygiene are the risk factors for dermatophytosis.[8] The type and frequency of dermatophytosis may vary with time, depending on changes in living standards and also due to preventive measures like personal hygiene.[9]

Tinea cruris is found in all parts of the world and it appears to be the major fungal infection of groin and perianal region. It occurs in epidemic proportions, in conditions where there is high rate of humidity, over population and poor hygienic conditions.

The dermatophytes remain restricted to the epidermal tissue. The inflammatory response involves the dermis and malphigian layer of epidermis but the fungus is found growing only in the stratum corneum of the epidermis.[7]

Sources of infection include direct contact with other human being (Anthropophilic), animals (Zoophilic), soil (Geophilic), infected clothing, footwares. Clinical findings named according to the site of infection include the followings: Tinea barbae (beard and moustache), Tinea faciei (face), Tinea capitis (scalp, eyebrow, and eyelash), Tinea cruris (groin), Tinea manuum (hands), Tinea pedis (feet)

Depending upon the morphology they are divided into three main genera

- Epidermophyton (Infect skin, nail and not hair).
- Trichophyton (infect skin, hair and nail),
- Microsporum (infect skin and hair and not nail).[10]

Delay in treatment due to use of indigenous medication and house hold remedies leads to the spread of disease faster. Indiscriminate use of antifungal agents and other topical applications alter the pattern of appearance and make diagnosis difficult and make most of the fungal infection treatment resistant. So early and accurate diagnosis is essential for timely administration of antifungal agents.[11] This study of pattern of fungal infection will throw light for a proper diagnosis and management.

Aims & Objectives

AIMS AND OBJECTIVES

1. To study the pattern of superficial dermatophytic infections of the skin in relation to demographic factors.
2. To find out the causative fungal organism
3. To identify the factors responsible for transmission of superficial dermatophytic infections of the skin.

Hypothesis & Scientific Justification

HYPOTHESIS AND SCIENTIFIC JUSTIFICATION

HYPOTHESIS:

The null hypothesis states that sharing of fomites have no role in spread of superficial dermatophytic infections of the skin

SCIENTIFIC JUSTIFICATION OF THE STUDY:

Dermatophytosis is one of the infections which is not given due importance by major section of population in society. In case of children, adolescents and poor working class people it induces certain amount of morbidity. Hot and humid climate in tropical and subtropical countries like India makes dermatophytosis or ringworm infection, a very common superficial fungal skin infection.[12] Dermatophytosis remains a significant public health problem affecting children, adolescents and adults and has also cosmetic importance.[13,14]

In the urban population, the patients seek medical attention mainly for cosmetic reasons and to a lesser extent for the discomfort. Infection from animal species has become quite common due to the prevalence of fungal infection among pet animals. School going children contribute significant population in the study of pattern of fungal infection who attend a tertiary care centre. This study will help for the effective control and eradication of various types of superficial fungal infection in a population and to find out the prevention strategy. The clinical presentation, though very typical of ring worm infection, is very often confused with other skin disorders, where laboratory diagnosis and conformation becomes necessary.[12] There are only few studies that examine the various pattern of superficial fungal infections in South India.

Review of Literature

REVIEW OF LITERATURE

ANATOMY[15]

Epidermis

The epidermis is stratified squamous epithelium. Derivative structures are (appendages) which includes hair, sebaceous glands, apocrine glands, sweat glands and nails. The thickness of the epidermis varies between 0.4 and 1.5 mm. More than 95% of epidermal cells is constituted by keratinocytes.

Other cells in epidermis are

- Melanocytes
- Langerhans cells
- Merkel cells

Morphologically these are divided into

- Stratum basale
- Stratum spinosum
- Stratum granulosum
- Stratum lucidum
- Stratum corneum.

Malpighian layer is the term used which includes both the basal and spinous cell layer.

Stratum Basale

Stratum germinativum is the other name.

Only one cell thick, but may be two or three cells thick in glabrous skin and hyper proliferative epidermis. Basal cells - small and cuboidal (10–14 nm) with large, dark-staining nuclei and a dense cytoplasm. They contain ribosomes and tonofilaments, membrane-bound vacuoles which has melanosomes transferred from melanocytes by phagocytosis. The stratum basale is the primary site for mitotically active cells. Every eighteenth to nineteenth day- cell division occurs.

The cells in basal layer are

i. Stem cells
ii. Transient amplifying cells
iii. Post mitotic cells.

Stratum Spinosum

Other name- prickle cell layer. This layer contains 8 to 10 layers of cells. These cells are polyhedral with a round nucleus. The cells in the upper spinous layer are larger, more flattened and contain organelles called “lamellar granules”. Due to the presence of the spine-like appearance of the cell margins in histological sections (these spines correspond to the abundant desmosomes) this layer is called the spinous layer. Desmosomes are symmetrical, laminated structures and they interact with adjacent

keratinocytes and provide a network for stability. Mechanical coupling between epidermal cells is provided by the desmosomes. Physiologic communication occurs at the gap junction. Limited cell division occurs in this layer.

Stratum Granulosum

Due to the presence of intracellular basophilic keratohyaline granules this name is given to this layer. Cells are 2 to 5 layer thick. Cell contains lamellated granules known as membrane coating granules or Odland bodies.

Stratum Corneum

It is the outer most layer, has 20-25 layers corneocytes which are the largest cell of epidermis which contain soft keratin and are stabilized by intermolecular disulfide bond. Cells are flat with no nucleus.

Desmosomes play a role in joining them. Lipids released from lamellar bodies surround these cells and are responsible for the permeability of this layer.

Stratum Lucidum

Present over the palms and soles. This layer is electron lucent so is called by this name. This layer is present between the stratum granulosum and stratum corneum. These cells contain nucleus and are called as “transitional cells”.

Blood vessels and lymphatics:

Skin has a rich vascular network. It includes arterioles, terminal arterioles, pre-capillary sphincters, arterial and venous capillaries, post-capillary venules and collecting venules. Cutaneous vessel network formed between the sub cutaneous adipose tissue and the dermis arises from the deep plexus, the fascial network in the skin. From this various vessels branch out to reach the appendages and ascending arteriole arises to generate a sub papillary plexus from which capillary loops are formed which enters the papillary dermis. Epidermis is avascular.[7] Vasculature has various roles in the skin

- Provide nutrients and oxygen
- Regulate body temperature

The blood flow is regulated where opening causes dissipation of more heat and constriction causes slowing of blood flow to the skin which in turn conserves energy.

Endothelium constitutes the inner most component of the blood vessel. Arteriole contains a subendothelial layer of elastic tissue in contrast to venules. Pericytes surround the endothelium of the capillaries, small arteries and venules. Ascending arteriole contain mainly smooth muscle cells. Basement membrane surrounds both the smooth muscle cell and the pericytes. Veil cells are long, thin cells with an attenuated cytoplasm, and they closely resemble fibroblasts than pericytes. They do not have a basement membrane investment and are located outside the vessel wall.[7]

DERMATOPHYTES:

Dermatophytosis is a superficial fungal infection of keratinized tissue. Commonly designated as Tinea. Dermatophytes are defined as keratophilic organisms that invade the hair, nail, skin. Dermatophytes are classified as

Kingdom	:	Fungi
Phylum	:	Ascomycoma
Order	:	Onygenales
Genus	:	Anthroderma, Nannizia

The dermatophytes represent 39 closely related species in three genera: Microsporum, Trichophyton, Epidermophyton of Deuteromycota or Fungi imperfecti.

Grouping of dermatophytes based on ecology and host preference:

Anthrophophilic - E.floccosum, M.audouinii, M.ferrugineum, T.concentricum, T.gourvilii, T.mentagrophytes var.interdigitale, var.nodulafe, T.rubrum, T.schoenleinii, T.soudanense, T.tonsurans, T.violaceum, T.yaoundei

Zoophilic - M.canis, M.gallinae, M.persicolor, T.equinum, T.mentagrophytes var.erinacei, var.mentagrophytes, var. quickeanum, T.simii, T.verrucosum

Geophilic - M.cookei, M.gypseum, M.fulvum, M.nanum, M.praecox, M.vanbreuseghemii.[15]

The following host factors play a role;

1. Age: Tinea capitis most commonly occurs in boys
2. Sex: Tinea cruris is more common in men.
3. Geographic location and habits: Climate plays an important role .Tinea pedis is more common in people who use occlusive foot wear. Tinea corporis is relatively more in hot and humid climate. In Indian women, it most commonly occurs over the waist line.[16,17]
4. Genetic predisposition: Certain evidences suggest that dematophytosis have a genetic predisposition.[18]
5. Virulence of infective organism: Certain difference exists in the same organism due to different strain and also between different species.

   For example, T. mentagrophytes var. Mentagrophytes which is a zoophilic organism produces marked inflammatory reaction in a human host, whereas T. Mentagrophytes var. interdigitale produces a rather noninflammatory infection.
6. Endocrine and metabolic factors: Resistance plays an important role in making the person suseption to dermatophytic infection.
7. Temperature: Except trichophyton verrucosum, dermatophytes grow poorly at 37^{o}C. This explains why these organisms do not invade deep.
8. Competing organisms and co pathogens: Penicillin-like antibiotics are produced by certain dermatophytes, and this suggests an antagonist relationship between the ringworm fungi and normal skin bacteria.

PATHOGENESIS:

Genetics:

People with almost the same risk factors are not equally vulnerable to most of the dermatophytic infections. Certain defects in innate and adaptive immunity support that. One of the first fungal diseases thought to have a genetic predisposition was Tokelau or tinea imbricata. Jardat et al suggested that low defensin beta 4 plays a role in predisposition of a patient to dermatophytic infection.[19]

Many factors play a role in facilitating adherence of fungus to the host tissue.

The following stage occurs after inoculation in the host tissue:

Adherence:

Spingosines produced by the keratinocytes, fatty acids produced by the sebaceous glands and the arthroconidia adhere to the tissues. Proteases secreted by the dermatophytes also facilitate adherence. Adhesions which are carbohydrate specific seen on the surface of the microconidia help in adherence of trichophyton rubrum.

In T. Mentagrophyte-fibrillar projections play a role. Fungal arthroconidia adhere to the keratinocytes by long and sparse fibrils. In the inner skin layers, the entire surface is covered by newly formed arthroconodia with short and thin appendices.[20] Zurita and Hay observed that

by 3 – 4 hours the maximum adherence of Trichophyton spp. arthroconidia to keratinocytes in suspension occurs. [21] By 6 hours adherence and germination of T. mentagrophytes arthrospores were observed. [22]

After adherence of the infected arthrospores in the epidermis, germination, hyphae prolongation occurs followed by penetration of the hyphae

Penetration:

Proteases present in the dermatophytes digest the keratin into assimilable oligopeptides or amino acids.[20] Once as the germination occurs, spores penetrate the stratum corneum rapidly when compared to desquamation. Serine-sublisins and metallo-endoproteases(fungalysins) formerly called keratinases produced by the dermatophytes also facilitate penetration.[20,23] Viani et al found a direct relationship between keratinases and pathogenicity. Dermatophytes also produce hydrolase such as lipases and ceramidase. [20] Nutrition is also produced by mucolytic enzymes.[20,24]

The proteases produced by the dermatophytes do not act before disulfide bridges are reduced which constitute the keratinized tissues. This depends on a gene Ssul1 which encodes a sulphite efflux pump. This pump excretes sulphite, which cause sulfitolysis of proteins and make them available for proteases and also acts as a detoxifying pathway.[20] Ranganathan also had a similar observation on the relationship between low-protease profile and chronicity of *T. rubrum* isolates.[25]

DEVELOPMENT OF HOST RESPONSE:

Erythema, vesicle or pustule are caused by diffusion of the fungal metabolite through the malphigian layer. DHT is responsible for acute dermatophytosis while IH is responsible for persistent disease.[20]

ACQUIRED RESISTANCE:

Macrophages, interferon alpha, lymphocytes which mediate action of DHT are effective against dermatophytosis. Chemotatic factors, complement pathways mediate immune detection and chemotaxis.

Factors playing role in immune resposne in dermatophytosis are

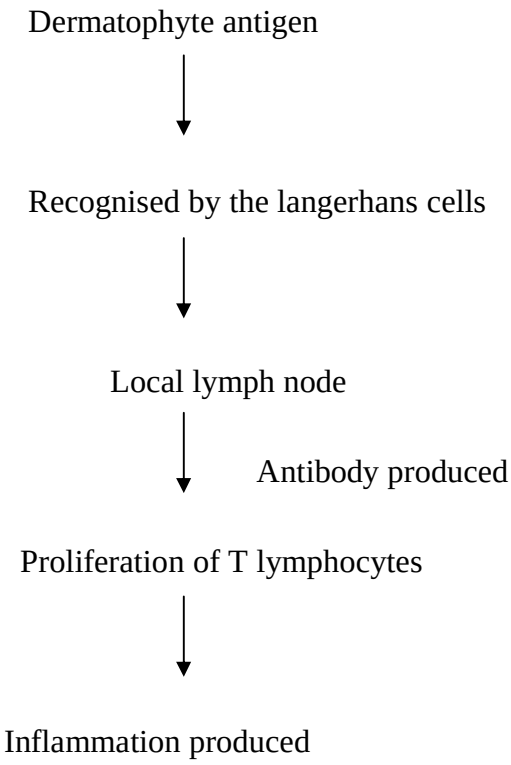
1. Species of the dermatophyte
2. Host species
3. Pathophysiological state of the host. [20,26]

Zoophilic species infections are more inflammatory in nature and they heal spontaneously. The anthrophilic infections are more chronic in nature, less circumscribed and appear less resistence to re infection. [27]

HYPERSENSITIVITY REACTION:

Dermatophytid reactions occur at distant sites from primary fungal infections which are eczematous. [27]

ANTIBODIES:



NONSPECIFIC RESISTANCE:

Immunological and non immunological mechanisms play a role in the defence mechanisms.

Factors influencing dermatophyte infection:

1. Number and activity of sebaceous gland
2. Break in the skin barrier
3. Increased hydration
4. Macerated skin

The infection remains restricted to the keratinized tissue by the following factors,[28,29]

1. Affinity for cooler skin temperature
2. Serum inhibitory factors (beta- globulins, ferritin, metal chelators)
3. Binding to iron[23]

Growth of these organisms are inhibited by unsaturated transferrin by binding to the hyphae.[30] Alpha 2 macroglobulin keratin inhibitor is seen in the serum.[31] Humoral immunity plays a minor role in acquired resistance to dermatophytoses.[32]

Delayed type hypersensitivity can play a major role in the eradication of infection. The following factors plays a role:

i. In primary infections where delayed type hypersensitivity occurs in parallel with the inflammatory response
ii. The association between acute highly inflamed lesions
iii. Failure to develop infection after experimental inoculation when delayed type hypersensitivity is present.[33-38]

DHT increases significantly with age.

Jha BK et al.[39] conducted a study between September 2012-November 2012 regarding the increasing incidence of dermatophytic infection among patients to study the clinical variant, species of fungus causing dermatophytic infection, epidemiological factors responsible for the disease in central Mysore.

The prospective observational analysis of clinically suspected 920 positive cases out of 1418 dermatophytic infection attended at the Dermatology department of K R Hospital, Mysore, India was selected for the above study. In this study they concluded that dermatophytosis were observed between June to September and almost half of patients were farmers by occupation. Dermatophytosis were common in males(55.7%) when compared to females(44.3%) and majority of cases 243(26.4%) were between 26-40 years of age and the most common clinical presentation was Tinea coproris 289(31.4%)> Tinea capitis 187(20.3%)> Tinea cruris130(14.1%)> Tinea pedis 99(10.7%)> Tinea manuum 51(5.5%)> Tinea faciei 32(3.4%)> Tinea barbae 21(2.2%). In the above study the predominant causative fungal species isolate was Trichophyton rubrum> Trichophyton tonsurans> Trichophyton verrucosum.

Neetu Jain et al.[40] conducted a study between April 2006-September 2006 regarding spectrum of dermatophytosis in outpatient department of skin, SMS hospital, Jaipur. 196 cases were included in the study. KOH positivity was seen in 148 cases and culture positivity was seen in 160 cases. In the above study they concluded that in all age groups Tinea corporis had the highest incidence. Tinea cruris was the second most common followed by Tinea capitis, Tinea manuum, Tinea unguium. In the above study these infections were more frequent in the age group of 21-30 years(26%)>31-40 years(18.8%)>11-20 years(16.3%). Males(75.5%) were more affected than females(24.5%). They concluded in this study that in 53 cases T. rubrum was isolated.

Faisal et al[41] conducted a study to determine the types and prevalence of dermatophytes from the clinical specimens received at Armed Forces Institute of Pathology(AFIP), Rawalpindi. The above study was carried out at Department of Microbiology, AFIP, Rawalpindi from June 2009 to May 2010. Total of 400 different clinical specimens were dealt during this study period. In this study, out of total specimens, 221(55.25%) yielded fungal growth and the yield of dermatophytes were in order of nail(78%)>skin(18.3%)>hair(3.3%). In the above study they concluded that Trichophyton interdigitale was the most common dermatophyte as a causative agent of dermatophytosis and onychomycosis was the most common fungal infection in northern Pakistan and there is predominance of dermatophytes as a principal pathogen in the cutaneous fungal infection in Pakistan.

KK Surendran et al.[42] conducted a clinical and mycological study of dermatophytic infection in 100 patients in Father Muller Medical College Hospital, Mangalore. In this study 100 patients (62 males and 38 females) clinically suspected as having dermatophytosis were enrolled and was it was conducted between August 2005 - July 2006 in randomly selected patients from Dermatology outpatient department, Father Muller Hospital, Mangalore. Both sexes of age group 1-60 years were included in the above study and they concluded that the most common clinical presentation was Tinea corporis(44.3%)> Tinea cruris(38.2%)> Tinea pedis(2.7%)> Tinea manuum(3.3%)> Tinea ungiuum(8.1%)>Tinea barbae(2.1%)>Tinea faciei

(1.3%), Trichophyton rubrum was the most common isolate. Out of 100 cases, 96 were positive for fungal elements on microscopy and 39 were culture positive. It was observed that potassium hydroxide microscopy and culture positivity was seen in 35 cases and 4 cases were culture positive and direct microscopy negative. Higher incidence was found in males (62%) than in females (38%). In females, Tinea corporis(44%)>Tinea cruris(32%) was the most common clinical presentation. In males, Tinea cruris(68%)> Tinea corporis(56%) was the most common clinical presentation.

Sheik Munir et al.[43] conducted a study on Epidemiological and clinico mycological aspects of fungal infection of skin and its appendages between January 2010-January 2011in outpatient department in a Tertiary Care Hospital and Medical College, Kashmir. Samples were collected from 402 clinically suspected cases of superficial fungal infection. In the above study out of 402 patients 240 were males and 162 were females, 298(74%) cases were direct microscopy positive and 128(61.04%) cases were culture positive and 10 samples were culture positive and direct microscopy negative. The most common fungal isolate was Trichophyton rubrum> Trichophyton mentagrophyte. 80 cases (19.9%) were in age group 2-40 years>190 cases (47.24%) between 41-50 years>132 cases (32.7%) between 51-60 years of age. In this study the most common age group affected was 16-30 years of age and most of the patients were manual labourers.

Ndako et al.[44] conducted a study about the prevalence of dermatophytes and other associated fungi among school children. In above study children aged 3-13 years old were screened between March-August 2008 for fungal infection consistent with dermatophytosis on the skin, scalp, hands, feet, trunk, legs from five selected Islamiyya nursery and primary schools scattered across Nassarawa Local Government Area of Kano metropolis after due clearance from school heads, parents, and students. In this study, a total of 100 samples were collected and positive growth was seen in 91(91%) from which 66(72.5%) were males, 25(27.5%) were females. Dermatophytes was observed in 53(58.2%) of patients out of which 39(73.5%) were males and 14(26.5%) were females. The causative organism of dermatophytes observed in this study in descending order of prevalence are M. ferrugenium(15.4%), M. canis(15.4%), M. audounii(9.9%), Trichophyton concentricum(5.5%), Trichophyton verrucosum(3.3%), Trichophyton rubrum(3.3%), Trichophyton mentagrophyte(2.2%), Trichophyton tonsorans(1.1%), Trichophyton schoenleini(1.1%). In the above study they concluded that dermatophytes occurred in higher frequency in children who play outdoor, who had contact with domestic animals and who lack the luxury of school seats during class room learning.

Bhavar Hitendra et al.[45] conducted a study on superficial mycosis with clinical mycological profile in tertiary medical hospital in Ahmedabad, Gujarat. 377 patients who attended the outpatient dermatology department in

GMERS Medical College, Sola, Ahmedabad between January 2011-December 2011 were enrolled in this study. In the above study males and females were affected in the ratio of (2.14:1) and 68.16% were KOH positive and 20.15% were culture positive. In this study Tinea corporis (199/377) was the most common clinical presentation except for children between 6-11 years were Tinea capitis was the most common clinical presentation and the second most common clinical presentation was Tinea cruris(59/377). It was observed that Trichophyton rubrum was the most common organism isolated and increase incidence were seen in the monsoon months.

Certain studies have also included other superficial mycosis:

Sweta R Prabhu et al[46] conducted a study in 2013 on Clinico-Mycological study of superficial fungal infections in coastal Karnataka, India. In this study 96 patients who attended the dermatology OPD at a tertiary hospital in Mangalore were included. In this study they concluded that male to female ratio was 0.74:1 and majority of the patients were in the age group 30-45 years with 33 patients (34.37%); 28 were in the age group 15-30 years (29.16%); 27 were in the age group of >45 years; 8 patients were in age group of 1-15 years with 30 patients leading with diagnosis of Pityriasis versicolor followed by 18 patients with Candida albicans and 18 patients with Tinea manuum and Tinea pedis, 13 patients with Tinea cruris, 11 patients with onychomycosis, 4 patients with Tinea corporis, 2 patients with Tinea capitis. Among the isolated organism, all were KOH positive (100%), 78.2% dermatophytes were culture positive. In

this study commonest sites affected ware groin and skin flexures. This study emphasized the timely diagnosis of cutaneous fungal infection in preventing transmission and spread of such infections.

Shukla et al.[47] conducted a study among 400 patients attending outpatient department at Eras Lucknow Medical College and Hospital between January 2012-2013 who were clinically suspected to have superficial mycosis regarding the prevalence of superficial fungal mycosis among out patients in a tertiary care hospital to describe the prevailing spectrum and frequency of various fungal infections among the dermatophytosis. 400 cases were included in this study. In 326(81.5%) of cases evidence of fungal elements on microscopy was seen and 74 cases(18.5%) were KOH negative on microscopy. Culture growth was seen in 292(73%) cases and 66(16.5%) were culture negative. In 22(5.5%) cases, both microscopy and in culture reports came negative. Out of the total cases included in the study, 316(79%) cases were diagnosed as Dermatophytoses followed by 42(10.5%) cases of Pityriasis versicolor and 42(10.5%) cases of superficial candidiasis. Among the age group of 0-10 years(11%) tinea capitis was reported maximum. Tineacorporis was the most common in the age group of 21-30 years(5%). Tinea corproris was the most common presentation and Tinea pedis was the most common in 31-40 years(2%), Tinea mannum was the most common in the age groups of 21-30 years and 51-60 years(1.5%). In this study, they concluded that the most common clinical presentation was Tinea capitis and most common isolate was

Trichophyton mentagrophytes and male and female ratio(1:1) was equal in Tinea capitis. In this study in all other clinical types males were affected more than females. It was observed that 21-30 years was the most common age group affected. The least common affected group was 71-80 years(2.5%).

Muhammed Hassibur Rahman et al.[48] conducted a study regarding the prevalence of superficial fungal infection in the rural areas of Bangladesh from January 2008- December 2008. There were 3438 patients who visited the outpatient department. 601 patients (310 males & 291 females) who were diagnosed to have superficial fungal infection aged between birth-90 years were included in the study. In this study Tinea corporis (22.63%) was the most common clinical presentation followed by Pityriasis versicolor(12.81%), oral thrush (12.48%), Tinea capitis(10.32%), Tinea pedis(9.82%), Tinea cruris(8.32%), candida intertrigo(6.49%), onychomycosis(4.33%), chronic paronychia(3.49%), Tinea faciei(3%), Tinea manuum(1.83%), Tinea incognito(1.66%), Tinea barbae(1%) and they concluded that superficial fungal infections are of concern in both sexes and in all age groups. The pattern and distribution was very high particularly in rural areas of Bangladesh. In the above study tinea capitis and tinea corporis were seen in higher frequency in children while common clinical presentation in adults were Tinea corporis (17.40%), Pityriasis versicolor, Tinea cruris. It was found in this study that the frequency of Tinea corporis, Tinea pedis, onychomycosis were most common in elderly patients.

Parut Patel et al.[49] conducted a study on superficial mycosis to study the pattern of dermatophytosis and non-dermatophytic fungi with most common fungal pathogen in south Gujarat region of India between May 2003-November 2004 in a teaching hospital which is a tertiary care hospital in Surat, South Gujarat, India. In this study 198 cases were included, of which 127(64.4%) were males and 71(35.88%) were females. 123 out of 198 (62.12%) were positive for fungal elements in microscopy, in which 58(29.29%) were culture positive. In the above study they concluded that Tinea corporis is the most common clinical presentation and Trichophyton rubrum is the most common causative organism. Pityriasis versicolor was isolated in 22.3% of cases and candida from 8% of the cases. In the above study the most common affected age groups were 21-30 years with 58 cases (29.30%)>11-20 years with 41 cases (20.70%)>31-40 years with 40 cases(20.20%)>more than 50 years with 24 cases(12.12%)>0-10 years with 19 cases(9.59%)>41-50 years with 16 cases(8.08%).

HISTORICAL BACKGROUND:

It was discovered by Johann Schonlein that the condition ring worm also called as favus was caused by the fungus Achorion Schonleinii. In 1841, David Gruby found that the disease is reproducible by experimental inoculation of the fungus in the skin. In 1852 Sabourauds agar was discovered which is used to culture dermatophytes.[50] and the pH of this agar was adjusted to neutral levels by Chester Emmons.[51]

TINEA CAPITIS:

Children are affected more.[15]

Trichophyton and microsporum causes invasion of the hair follicle. Broken hairs are seen close to the skin, producing tonsured areas implanted. It can manifest clinically as:

Non-inflammatory dermatosis: Ectothrix fungus (for instance, M. canis, the main organism in Brazil) or endothrix fungus, like T. Tonsuransis is the cause of this type of dermatosis.[52] In trichophytic tinea infection , hair loss are small and appear as black dots. Pustular lesions or kerion folliculitis can occur. With treatment hair becomes normal.

Folliculitis capitis abscedens et suffodiens: Interconnecting tunnels occur in this type of folliculitis. Abscess formation seen here. The most common cause is staphylococcal but, when mycoic, the most common cause is T. tonsurans. The other name is perifolliculitis abscedens of Hoffman, described in 1956 by Ramos and Silva.[53,54]

Inflammatory dermatosis: T. Schoenleinii is the most common cause. It is also termed as tinea favosa, which evolves chronically. It affects large area of the scalp and presents as confluent, yellowish crusts (favus scutula). Scarring alopecia can occur when not treated.[53,54]

Gray patch or the non-inflammatory type of tinea capitis: Small papular lesions which are erythematous occur surrounding a hair shaft. Then

centrifugal spread occurs. Typically, there are patches of partial hair loss which appear circular and have many broken off hair which are grey in colour. Microsporum audouinii is the most common cause.[15]

Kerion or the inflammatory type of tinea capitis: T. verrucosum or T. mentagrophytes are the most common cause. Kerion- boggy swelling studded with pustules, vesicles. Sinus formation can occur. Thick crusts causing matting of hair can also occur. Associated lymphadenopathy present mostly. Healing leads to scarring.[15]

"Black dot" tinea capitis: Endothrix organisms produces this type of tinea capitis. Hair shaft - extremely brittle and breaks at the level of the scalp. Black dot which appears on clinical examination is the remnant of the hair left behind in the infected follicle. There may be diffuse scaling with minimal hair loss or inflammation. When the hair loss occurs, the affected areas are characteristically multiple and polygonal in outline with distinct finger like margins.[15]

Favus: Occurs early in life. Yellow cup shaped crust made of dense mat of mycelia and epithelial debris called scutulum occurs. The concavity of this cup faces upwards and is pierced by a hair, around the orifice of which the cup has developed. Mousy odour occurs. Borders are polycyclic in nature. Centre- scarred and lack of hair is seen. Cicatricial alopecia occurs in late stages. Favus is seen in families and infection of generation after generations is well recognized. The commonest cause of favus is T.schoenleinii.

Complications of tinea capitis include

- Secondary bacterial infection
- Tinea in other parts of the body
- Cicatricial alopecia

TINEA CORPORIS:

This affects the stratum corneum of the glabrous skin. The palms, soles and groin are spared. *T. rubrum* and *T. Mentagrophytes* are the most common agents. Patients present with itching and burning. On Examination isolated or multiple erythematous squamous, circinate lesions, in plaques, papules, vesicles or pustules, with centrifugal growth, with tendency to central healing is seen. When topical steroids are used, they alter the morphological appearance of the lesion (tinea incognito).

TINEA CRURIS

Tinea cruris and tinea pedis or onychomycosis co-exist suggesting autoinfection. Tinea cruris is spread by hand from the tinea pedis. Tinea cruris is also known as “jock itch”. Affects male population more. Itching is the most common symptom. *T. rubrum, E. Floccosum* and *T. Mentagrophytes* are the most common organism. On Examination-macerated, erythematous-squamous lesions, starting in the inguinal fold, which can spread to the thighs, perineum, buttocks, pubic region and lower stomach, typically avoiding the scrotum is seen. Lichenification occurs in most cases.[55]

TINEA PEDIS AND TINEA MANUUM:

Tinea pedis and Tinea manuum coexist together. It occurs in persons who use occlusive footwear. It can occur due to bare foot walking.[56] *T. rubrum, E. Floccosum* and *T. Mentagrophytes* are the most common causes of tinea. Scaly lesion on a palmar surface occur in T. Manuum. Tinea pedis can present clinically with lesions:

- Acute: Most commonly caused by *T. mentagrophytes var mentagrophytes.*

Patients complain of itching. On examination- vesicles are present. It is an eczematous form.

- Intertriginous: Most commonly caused by *T. mentagrophytes var interdigitalis*

Sites affected are the interdigital folds. Clinically fissures and maceration are seen in this type.

- Chronic: Most commonly caused by *T. Rubrum*

Affect practically the whole plantar region presenting as itchy scaly lesions. They appear in "mocasin and/or glove" patterns, which may not be symmetrical.

Dermatophytes, candida and bacteria are the etiological agents for athlete's foot. They present with maceration, erythema, scaling and fissures.

TINEA BARABAE:

Also called tinea sycosis and barber's itch.[15] Presents with pustular lesions in beard area and the moustache. Evolution is generally chronic. As protection is provided by the fatty acids in sebum to the hair follicles - it rarely occurs in pre pubertal men.[15] It is a very rare type.

3 types are,

1. Inflammatory type
2. Superficial or sycosiform type
3. Circinate or spreading type

TINEA FACIEI:

Dermatophytic infection of the nonbearded region of the face. Burning, itching and photosensitivity can be the presenting symptoms. They show diversity in size, degree of inflammation, and depth of invasion. It begins as an erythematous scaly macule with peripheral extension. The central area becomes hypopigmented or brown and less scaly as this occurs. Tinea faciei can occur with a wide range of atypical presentations.[16]

TINEA IMBRICATA (tokelau)

Caused by *T. Concentricum.* Varient of Tinea corporis. Clinically presents as a squamous lesions in concentric circles, usually they are very itchy. It is endemic in certain parts of the world, in Polynesia ("tokelau"), and in Brazil (Mato Grosso and Amazonia), where it is called "chimbere".[53,54]

WOODS LAMP EXAMINATION:

Robert W. Wood, a Baltimore physicist discovered woods lamp in the year 1903. Margarot and Deveze in 1925 used it for detection of fungal infection of hair. [57] Hair produces a characteristic fluorescence in ultraviolet (UV) light filtered by Wood's glass when infected by certain dermatophytes due to a chemical called ptreridine. It consists of barium silicate which contains about 9% nickel oxide, of wavelength above 365 nm.

Wood's lamp is used in diagnosing fungal infections in individual patient and also as tool for mass screening.[58] The normal skin usually fluorescence faintly because of the elastin, aromatic amino acids and precursors or products of melanin. [59]

Certain measures should be kept in mind while using woods lamp in order to avoid misinterpretations of results.[60]

- Lamp should be warmed up for about 1 minute.
- The room in which we examine should be dark, preferably without window
- The examiner should get adapted to darkness in order to see the contrast clearly.
- Keep the light source 4 to 5 inches away from the lesion.
- Avoid washing area before examination to avoid false negative results which occurs as a result of dilution of the pigment

- Common sources of error can occur with ointments containing petrolatum which produce bluish or purplish fluorescence, ointments containing salicylic acid produce green fluorescence, and light reflected from examiners white coat producing light blue fluorescence. So it is necessary to clean any topical medicaments, soaps etc if present from the site before examination.

DIAGONSIS:

Laboratory investigations play an important role even if superficial fungal infections can be diagnosed based on clinical features.[61]

Dermatophytosis are diagnosed by two important methods

i. Direct microscopy

ii. Culture (Sabourads dextrose agar)

Direct Microscopy:

Direct microscopic examination in 10% KOH solution is considered one of the most important procedure in medical mycology.[62]

This procedure is done on an outpatient basis to establish evidence of fungal infection in skin, hair and nail. We can obtain the results within 1- 2 hours.[63] It is an easier, reliable and more useful procedure to diagnose fungal infections. It is more reliable than culture for demonstration of dermatophytes.[64]

The following steps are adopted for demonstration of dermatophytes:

Scraping [65]

The presence of fungal infection of the skin, hair, nail can be established by doing a scraping. The scrapings are collected and examined under a microscope. First, the skin lesion is cleaned using alcohol. For easy sampling, little distilled water can be applied. By pulling the skin above the site with one hand and moving the scalpel edge across the lesion the sample is collected. In tinea corporis, samples are taken from advancing margin of the lesion for detection of dermatophytes.

KOH mount [65]

Skin scraping is collected on a black paper or directly on the slide using a scalpel from the edge of the lesion. 10-30% KOH is usually used. After sample is collected on a glass slide from the advancing border of the lesion using a blunt scalpel, add KOH and place the cover slip. Now heat the slide gently and then examined for the presence of fungal elements. Special transport packs backed by black card when available can be used to transport the scrapings. [93]

Microscopic examination [65]

In order to view the presence of fungal spores and hyphae this procedure is done. In this procedure first we examine under low power magnification (x10) and then under high power magnification (x40) for better illumination so that the morphology of the fungus can be studied. Fungal

spores vary from 2-10 mm in diameter. Sometimes the lines of juncture of normal epidermal cells dissolve into branching network and these are easily mistaken for a fungal structure. This is called 'mosaic fungus'. Cotton fibres and synthetic fibres can also mimic fungal hyphae.[66]

For microscopic examination 10% to 40 % KOH is used.

Counter stains such as Parker's blue black ink, Periodic acid Shiff or fluorescent stains such as Calcoflour can be used to visualise the fungal elements.

MODIFICATION [67]

Parker's ink method

Stains the fungal wall blue.

Eosin 1% method

Eosin 1% when added to potassium hydroxide stains keratin. The fungal elements remain unstained and the background appears pinkish.

Modified Parker's ink and 1% eosin method

Modified parkers stain is prepared by adding 1% eosin to Parkers ink in 2:1 proportion. Mixture is applied over the affected area and allowed to dry. Then the cellophane tape is reapplied, gently pressed, removed and stuck over a glass slide and viewed. Pink appearance of background can be seen which is due to eosin and blue appearance of fungal elements can be seen which is due to ink. Heating is not required here.

Calcofluor white

This is a colourless dye, a fluorochrome stain. When applied over scrapings from skin and mucous membrane it helps in rapid detection of the fugal elements . When viewed under ultraviolet light, fungal structures appear as brilliant apple-green or a ghostly blue-white colour.

Though direct microscopy is an easy and reliable test, 5-10% of false negative results may occur because,

- Inappropriate material or an insufficient quantity was obtained for analysis.
- Out dated or defective KOH used.
- Inadequate time was spent on examining the specimen.

DIAGNOSTIC USES OF KOH:

KOH is used in the diagnosis of,

- Dermatophytes, candida infection of the skin [68]
- Dermatophytic and candidial infection of nails [69]
- Dermatophytic infection of the hair
- Pityriasis versicolor [69]
- Vaginosis [68]
- Demonstration of mites
- Tinea nigra [70]
- Deep fungal infections

Laboratories select a simple glucose/peptone agar, either with 4% sugar, 1% peptone and an acid pH (Sabouraud's dextrose agar) or with 2% sugar, 1% peptone and a neutral pH (Emmon's modification). In order to reduce contamination, antibacterial antibiotics such as gentamycin (0.0025%) and/or chloramphenicol (0.005%) are added. The addition of cycloheximide at 0.04% will inhibit the growth of non-dermatophyte moulds. For moulds, the temperature of incubation should be 26–28°C and cultures should be held for a maximum of 3-4 weeks.[7]

Microsporum- macroconidia are rough, thick walled, range from fusiform to obovate in shape with 1-12 or more septa. Trichophyton- thin walled, smooth, cylindrical, fusiform or clavate in shape with upto 12 transverse septa. Epidermophyton- macroconidium is clavate, broadened and rounded at its distal pole, thin walled and has up to 5 septa. In some species like M.audonii, T.verrucosum, T.simii, a third spore produced called chlamydospore. In T.schoeninii and T.violaceum there may be only one kind of spore.[7,15]

Microscopic features

- The Spiral hyphae in T. Mentagrophyte.
- The knot like, twisted, entwined hyphal structures nodular organs of M. Canis, T. Mentagrophytes.
- The enlarged tennis racquet like hyphae in many species like T.tonsurans.

- The unilateral digitate comb teeth like projections of some mycelial branches, the pencinate bodies as seen in M.audonii.
- The curved, branching antler or chandelier like hyphae, the favic chandelier found in T.schoenleinii, T.violaceum.
- The large flask shaped specialized structures, the pycnidia filled with conidiophores characteristic of T.mentagrophyte.
- The arthroconidia characteristic of T.rubrum, T.soudanense.[15]

Characteristic lesions are circular, usually sharply marginated, erythematous, with a raised edge with peripheral scaling with central clearing. Single lesion occur, or there may be multiple plaques.[7,15]

TREATMENT OF DERMATOPHYTOSIS:

Systemic treatment is instituted when there are lesions covering a larger body surface area.[71]

NONPHARMACOLOGIC MEASURES

As fungi can live in moist environmental conditions, loose - fitting clothes made of cotton are advised to patients. Drying of the area is advised before wearing clothes. Patients should be instructed to avoid wearing occlusive shoes and barefoot walking. Patients should be educated regarding the spread of infection through fomite sharing and should be advised regarding the same.[72]

NONSPECIFIC AGENTS

Whitfield's ointment and Castellani's (carbol fuchsin solution) paint are still in use. They have no specific antimicrobial function.

ANTIFUNGAL AGENTS

Based on the structure and mechanism of action, fungi are classified into two principal groups.

- Azoles
- Allylamines.

Other groups- Polyenes -amphotericin B and nystatin

Other agents that do not fit into the two main groupings are tolnaftate, haloprogin, ciclopiro and butenafine.[73]

Once- to twice-daily treatment for two weeks is required to treat tinea cruris and tines corporis. To treat a case of T. Pedis 4 weeks of treatment is required. It is advised to continue treatment for atleast a week after symptoms subside.

An agent should have the following properties

- Clinical and mycological cure
- Symptomatic relief
- Low relapse rate

The efficacy is also influenced by other properties that a drug has like anti inflammatory, anti bacterial in addition to anti fungal properties.

The mechanism of action may have an effect on efficacy. The newer agents have fungicidal activity, which may translate into higher cure rates and lower relapse rates. Clinical judgment with regard to prior treatments and complicating conditions (bacterial growth or intense inflammation), along with knowledge of the agent's properties, will help guide the choice of therapy. When inflammation is a salient clinical feature, it must be considered in the selection of a treatment option.

The mainstay of treatment for dermatophytosis was Griseofulvin, since its introduction in 1958. After the introduction of many new triazole compounds, antifungal therapy has gained a new momentum in the treatment of dermatophytosis**.** Itraconazole which is a triazole and which has good antifungal spectrum (4-10 times greater than ketoconazole) is considered as the ideal treatment for dermatophytes.

Itraconazole, is extensively excreted through sebum and is incorporated in the basal layer which gives a constant delivery of the drug to the skin surface even 3-4 week after the end of the treatment.[74] There may be increase in the cure-rate after few more weeks, as the drug will be there even after the stoppage of treatment.[75] Itraconazole is considered as a better drug against dermatophytes when compared with ketoconazole and griseofulvin.

Many factors in topical preparation play a role in delivery of the drug in the treatment of fungal infections. The most important factor is its lipophilic nature. When applied to the skin, in the lipidic stratum corneum, a

depot is formed, so the drug gets released slowly to the underlying skin layer-dermis, epidermis. It is essential to control the release rate of this lypophilic drug so that high therapeutic concentration is achieved in order to obtain a good topical effect of the antifungal with a prolonged antibiotic effect.[76] Drug such as amphotericin B and ketoconazoles are known to exceed 500 Da and this led to the development of several carrier in order to improve topical drug delivery. They are obtained by

- finding a way into a shunt such as hair follicle
- accumulating between corneocytes, and intermingling with skin lipids
- by disintegrating and merging with lipidic layers. [77,78]

TOPICAL THERAPY:

Localized tinea corporis, tinea cruris, tinea faciei, and tinea pedis can be treated with topical therapy. In extensive cases, topical therapy acts as an adjunctive.

In a meta analysis by Rotta et al, it was concluded that, antifungals concerning the outcome of mycologic cure at the end of treatment did not differ statistically whereas in sustained cure butenafine and terbinafine was superior to clotrimazole.[79]

Cochrane review suggested that only few side effects occur with terbinafine and naftifine when used in the treatment of dermatophytosis. [80]

Moriarty et al. highlighted the use of topical applications in treating dermatophytic infections.

Various factors responsible for failure of therapy are:

1. Poor adherence to treatment
2. Resistance to drugs
3. Reinfection from close contact
4. Misdiagnosis,
5. Infection with uncommon species

When steroids are added to topical antifungals, in addition to their anti-inflammatory effect they increase the bioavailability of the antifungals.

Since steroids are easily available over the counter in countries like India, its use should be discouraged as it may lead to tinea incognito and also many other side effects such as atrophy, telengiectasia etc.

Indication of systemic antifungals in dermatophytosis [72]

- Tinea capitis
- Tinea involving the nails
- Tinea affecting more than one body region simultaneously
- Extensive Tinea corporis
- Tinea pedis when -extensive involvement of the sole, heel, or dorsum of the foot.

Tinea barbae:[73]

- Gresiofulvin 1 g daily.
- Itraconazole 200 mg daily for 2 - 4 weeks.
- Terbinafine 250 mg daily for 2- 4 weeks
- Fluconazole 200 mg daily for 4- 6 weeks.

Tinea corporis, Tinea cruris, Tinea Pedis:

Topical medications used are allylamines, imidazole, tolnaftate, butenafine, ciclopirox which are applied twice daily for 2- 4 weeks.

Oral antifungals are indicated in the following situations:

- Wide spread
- Failure to respond to topical therapy [81]
- Presence of more inflammatory lesions.

Trials have proved itraconazole 100mg/day to have a significant better clinical and mycological cure when compared with ultramicronized griseofulvin at the dose of 500mg/day when used in the treatment of tinea corporis and tinea cruris.[82] Study have also proven terbinafine to have a better mycological cure compared to griseofulvin when both are given at a dose of 500mg daily for 6 weeks in tinea corporis.[83] Study between itraconazole (100 mg/day) and griseofulvin (500 mg/day) found itraconazole to be superior in providing mycological cure.[84]

DOSES OF VARIOUS ANTIFUNGALS: [73]

- Fluconazole 150 mg weekly for 4- 6 weeks
- Itraconazole 100 mg daily for 15 days
- Terbinafine 250 mg daily for 2 weeks is effective as griseofulvin and no adverse effects present.
- In children- ultra microsize griseofulvin 10-20 mg/ kg for 6 weeks
- Itraconazole 5mg/kg/day for 1 week
- Terbinafine 3-6 mg/kg/day for 2 weeks

Tinea Pedis:

When the infection is mild without any associated infection, topical such as allyiamine, azole, ciclopirox, benzylamine, tolnaftate are used. Topical terbinafine is 66% effective when applied for a week.

- Terbinafine 250 mg daily for 2 weeks
- Itraconazole 200mg twice daily for 1 week/ 200 mg twice daily for 1 week/ 200mg daily for 3 weeks/100 mg daily for 4 weeks
- Fluconazole 150 mg weekly for 3 – 4 weeks

Antibiotics are given if associated secondary infection is present. Early attainment of clinical and mycological cure with decrease in duration of oral antifungal and good patient compliance is obtained by using keratolytic agents and topical antifungals along with systemic antifungals.[85] Topical terbinafine in treating tinea pedis following such-short-duration therapy is mainly due to its fungicidal action.[63]

CONTROL OF INFECTION:

The area affected, causative organism of the infection, source of infection play a major role in control of infection. Sharing of towels, soaps, clothing, razors, foot wear etc should be avoided. Scalp ringworm spreads via contaminated combs, brushes, hats, and pillows.[86,87] All items should be disinfected after use as dermatophytes can be transmitted from one person to another by them. The chances of children getting fungal infections can be minimized by making sure that they practice good hygiene.[88] Dermatophytes are common in people handling animals (dog, cat). Protective clothing's such as gloves are recommended as these infections can be sub-clinical. Proper foot care (washing feet, drying to avoid moisture, avoiding occlusive foot wear, not to share towels, shoes, socks) is essential to prevent tinea pedis. It is mandatory to educate them not to go bare footed to places like swimming pools. Children should be towel-dried after bathing to prevent any tinea infections.[89]

In tinea capitis, hair should be screened with woods lamp for fluorescence. In other non fluorescence type of tinea capitis, scalp is examined carefully for any lesions or any loss of hair and areas suspected to have these infections are cultured. The hairbrush technique may be helpful in detecting and culturing subclinical infections.[90]

Materials & Methods

MATERIALS AND METHODS

Study Design

Cross sectional study

Study Period

One year from June 2015 to June 2016

Study Setting

Patients in Dermatology, Venereology & Leprosy outpatient department in Sree Mookambika Institute of Medical Sciences, Kulasekharam.

Inclusion Criteria

1. Patients above 5 years of age
2. Patient with clinical features suggestive of superficial dermatophytic infection

Exclusion Criteria

1. Patients on prolonged immunosuppression and antibiotic therapy.
2. Patient on topical or systemic antifungal therapy recently(within a duration of 7 days)

Sample Size

In a study conducted by Swetha R Prabhu et al, the prevalence of dermatophytic infection of the skin was 46.8.[20]

So, p=46.8%

q=100-p=100-46.8=53.2

L=20% of 46.8=9.36

Substituting the values in the formula, we get: $4pq/^{L2}$

= $4x46.8x\ 53.2/9.36^{\ 2}$

= 9959.04/87.60=113

STUDY METHOD

Clinical Examination:

By Inspection:

- The site of the lesion
- Number of lesions
- Type of the lesion
- Colour change- if hyperpigmented or hypopigmented
- Scaling if present

Direct Examination:

The material obtained is placed on a glass slide containing 10% potassium hydroxide (KOH). The alkaline clearing solution (i.e. KOH) will digest the proteins, lipids, and most of the other epithelial debris that are present. The fungal filaments resist this treatment as they have a chitinous wall.

10% KOH (potassium Hydroxide) produced by, ESS CHEMS, Chennai.

Culture

Dermatophytes are cultivated on artificial media containing an organic source of nitrogen. Sabouraud's dextrose agar contains dextrose, peptone and agar. Emmon modified this medium by increasing the PH from 5.6 to 6.8-7.0 and reducing the percentage of dextrose from 4 to 2 (Neutral Sabouraud's dextrose agar). With addition of Chloramphenicol (500 mg) in one litre, this medium becomes selective for isolation of dermatophytes. Culture helps in species identification

Sabouraud Dextrose Broth Produced by,

HiMedia Laboratory Pvt. Ltd

23, Vandhani Ind. Est., LBS Marg

Mumbai – 400 086.

Standard Formula:

Ingredients:

1. Mycological peptone- 10grams / litre
2. Dextrose - 40grams / litre
3. Agar - 15 grams / litre

Final Ph (at 25 degree C) 5.6 plus or minus 0.2

When there is sporulation and pigment formation, a lactophenol cotton blue (LCB) mount of the growth is examined.

Lactophenol cotton Blue Reagent Produced by, Lab chemicals, Chennai.

Procedure in brief:

After approval of the study protocol by our Institution committee, written informed consent will be taken from each patient. Males and females of all age group with complaints and clinical features suggestive of superficial fungal infection will be enrolled in the study. All the patients will be briefed in detail about the procedure and informed consent will be obtained. The patients on recent topical or systemic antifungal therapy, debilitated patients, and immunocompromised patients are excluded from the study.

Collection of Specimen:

The lesion is first cleaned with 70% isopropanol and then the scrapings are taken with blunt edge of the scalpel blade from the edge of the ringworm lesion.

The specimens are collected on a clean sheet of paper. It is folded and transported. Certain techniques employed

1. If the skin to be scraped has very little scaling, the material can be directly collected on the glass microscope slide held against the skin. The slide is then covered with a second slide and both are held together by a paper fold.
2. Swabs moistened by sterile water can be used for sampling intertriginous or mucocutaneous sites.
3. If lesions are relatively dry, vigorous scraping is necessary

In Tinea capitis, after cleaning the area with spirit, dull, lustreless hair and stubs of hair are chosen and plucked by sterile surgical forceps. Woods lamp can be used to identify infected hair in case of dermatophytes like Microsporum audouinii.

Collection of material by rubbing over the erythematous scaly and alopecia region of the scalp with a moistened cotton swab produces a reliable culture method.

Direct Examination:

The material obtained is placed on a glass slide containing 10% potassium hydroxide (KOH). The alkaline clearing solution (i.e. KOH) will digest the proteins, lipids, and most of the other epithelial debris that are present. The fungal filaments resist this treatment as they have a chitinous wall.

Identification of the Dermatophytes:

Under the microscope, the dermatophytes may be identified as translucent, non-pigmented, septate mycelia or as arthrospores. In candidiasis budding oval yeast may be seen as pseudohyphae.

Culture:

Dermatophytes are cultivated on artificial media containing an organic source of nitrogen. Sabouraud's dextrose agar contains dextrose, peptone and agar. With addition of Chloramphenicol (500 mg) in one litre, this medium becomes selective for isolation of dermatophytes. Culture helps in species identification

The specimen is placed in an envelope to be transported to the laboratory. The specimen is planted for culture by furrowing it into the medium with a scalpel. 4 week inoculation at room temperature is required. Majority growth and sporulation occurs in 10 days. Precise identification accomplished by examination of section of sporulation area of colony under microscope. When there is sporulation and pigment formation, a lactophenol cotton blue (LCB) mount of the growth is examined.

Various characteristics are noted - colour, texture, rate of growth, pigments, microscopic morphology(size, shape, arrangement of spores, types of hyphal appendages and hyphal modifications).

Data Analysis:

Data will be collected and entered in Microsoft excel 2007

i. Significant level decided before starting of study: $p \leq 0.05$

ii. Statistical tests to be used for data analysis: Chi-square test, Percentile score can be calculated

iii. Software(s) to be used for the statistical analysis: All parameters will be entered in Microsoft Excel spread sheet and statistically analysed using SSPS trail version 17.0

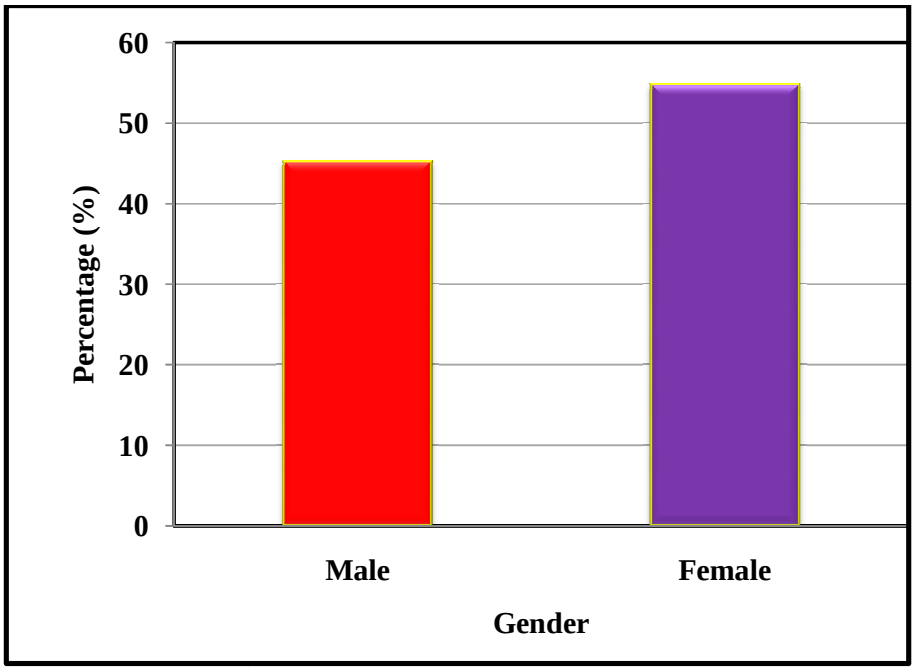
Analysis & Interpretation

DATA ANALYSIS

Statistical analysis:

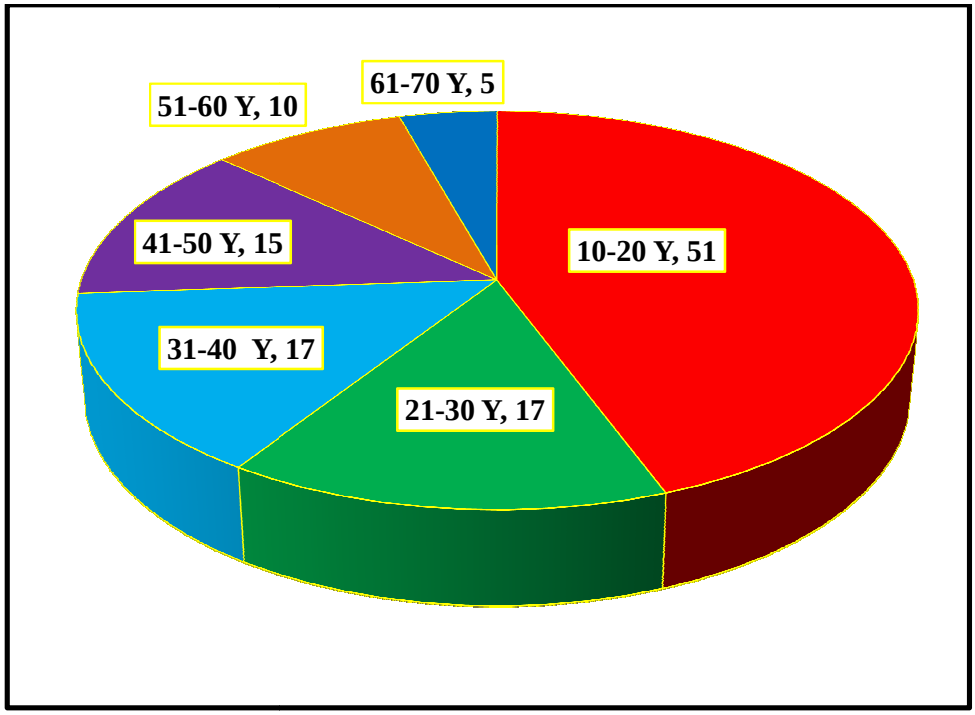
The data was expressed in number and percentage. Data was analyzed by SPSS (16.0) version. Student t test applied to find statistical significant between the groups. P value less than 0.05 considered statistically significant at 95 % confidence interval.

Graph-1: Distribution of patients based on gender



In this study the females outnumbered males. Females constituted 54.78% of the patients. Males were 45.22% of the patients.

Graph-2: Distribution of patients based on age

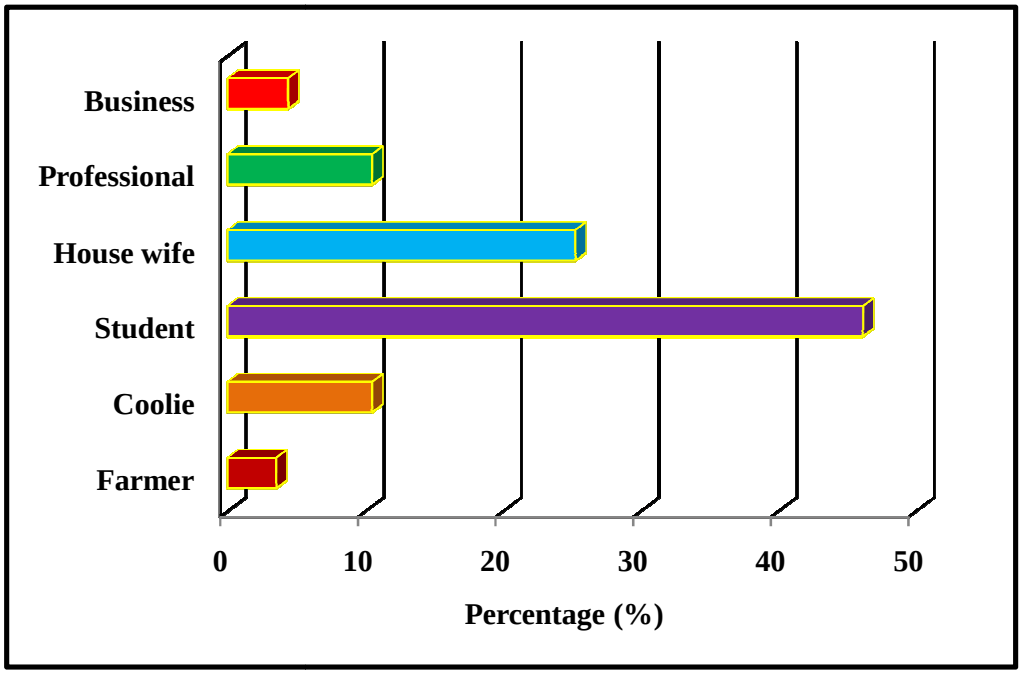


In this study maximum number of patients were in the age group of 10-20 years (44.3%) of age followed by patients in the age group of 2 -30, 31- 40 years each group constituting (14.7%). The least common affected group was 61 to 70 years of age (0.43%).

Table-1: Distribution of patients based on occupation

Occupation	Number	Percentage	p value
Farmer	4*	3.48*	**0.04**
Coolie	12*	10.43*	
Student	53	46.09	
House wives	29*	25.22*	
Professional	12*	10.43*	
Business	5*	4.35*	
Total	**115**	**100.00**	

(*p<0.05 significant compared students with others)



Graph-3: Distribution of patients based on occupation

In this study maximum number of patients were students (46.09%) followed by house wives (25.22%) who constituted the bulk of our study. Coolie workers contributed 10.43% of patients. 3.48% were farmers.

Table-2: Distribution of patients based on educational status

Educational status	Number	Percentage	p value
Illiterate	29*	25.22*	**0.04**
Undergraduate	77	66.96	
Postgraduate	9*	7.83*	
Total	**115**	**100.00**	

(*p<0.05 significant compared undergraduates with others)

In this study maximum patients were undergraduates constituting (66.96%) followed by illiterate around (25.22%) and post graduates were 7.83% of patients.

Table-3: Distribution of patients based on monthly income

Monthly income in Rupees	Number	Percentage	p value
No income	82	71.30	**0.03**
In 100s	16*	13.91*	
In 1000s	17*	14.78*	
Total	**115**	**100.00**	

(*p<0.05 significant compared no income with others)

In this study most of the patients were in no income category as most of our patients were students and house wives**.**

Table-4: Distribution of patients based on area of living

Monthly income	Number	Percentage	p value
Urban	30	26.09	**0.04**
Rural	85*	73.91*	
Total	**115**	**100.00**	

(*p<0.05 significant compared rural with urban)

In this study most of the patients were from rural area constituting around 73.91%

Table-5: Distribution of patients based on major complaints itching

Itching	Number	Percentage	p value
Yes	115	100.00	**0.03**
No	0*	00.00*	
Total	**115**	**100.00**	

(*p<0.05 significant compared Yes with No)

In our study itching was present in all patients

Table-6: Distribution of patients based on major complaints duration of itching and lesion

Duration of itching and lesion	Number	Percentage	p value
1-7 days	12*	10.43*	**0.03**
One month	33*	28.70*	
Above one month	70	60.87	
Total	**115**	**100.00**	

(*p<0.05 significant compared 1-7 days with others)

The duration of lesion lasted for more than 1 month in 60.87% of our patients followed by itching within 1 month but more than a week in 28.70% of our patients followed by itching lasting for 1 week in 10.43% of our patients

Table-7: Distribution of patients based on past history

Past history	Number	Percentage	p value
No	101	87.83	**0.03**
Yes	14*	12.17*	
Total	**115**	**100.00**	

(*p<0.05 significant compared Yes with No)

The above table shows 12.17% of the patients had a past history of similar complaint in the last one year**.**

Table-8: Distribution of patients based on similar case among family members:

Similar among family members	Number	Percentage	p value
No	63	54.78	**0.04**
Yes	52*	45.22*	
Total	**115**	**100.00**	

(*p<0.05 significant compared Yes with No)

The table shows 45.22% of the patients had a history of similar complaints in the family members at the time of attending our OPD.

Table-9: Distribution of patients based on sharing of fomites among family members

Type of sharing of fomites among family members	Number	Percentage	p value
Towel	6*	05.22*	**0.03**
Soap	9*	07.83*	
Clothing	1*	0.87*	
Razors	0*	00.00*	
Footwear	0*	00.00*	
No sharing	65	56.52	
More than two fomites use	34*	29.56*	
Total	**115**	**100.00**	

(*p<0.05 significant compared no sharing with others)

History of sharing of fomites was present in 43.48 % of patients. Sharing of more than two fomites was present in 29.56% of our patients. 7.83% of our patients shared soap, 5.22% shared towel and 0.87% of patients shared clothing**.**

Graph-4: Distribution of patients based on sharing of fomites among family members

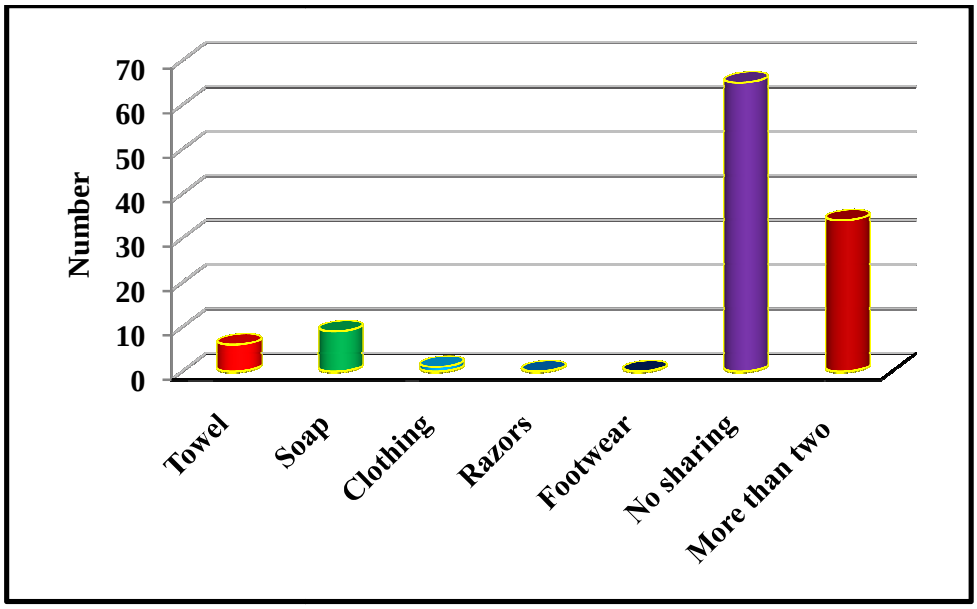


Table-10: Distribution of patients based on frequency of bathing

Frequency of bathing	Number	Percentage	p value
Every day	114	99.13	**0.03**
Every 2 days	1*	0.87*	
Once in 3 days	0*	00.00*	
Once in week	0*	00.00*	
Total	**115**	**100.00**	

(*p<0.05 significant compared every day with others)

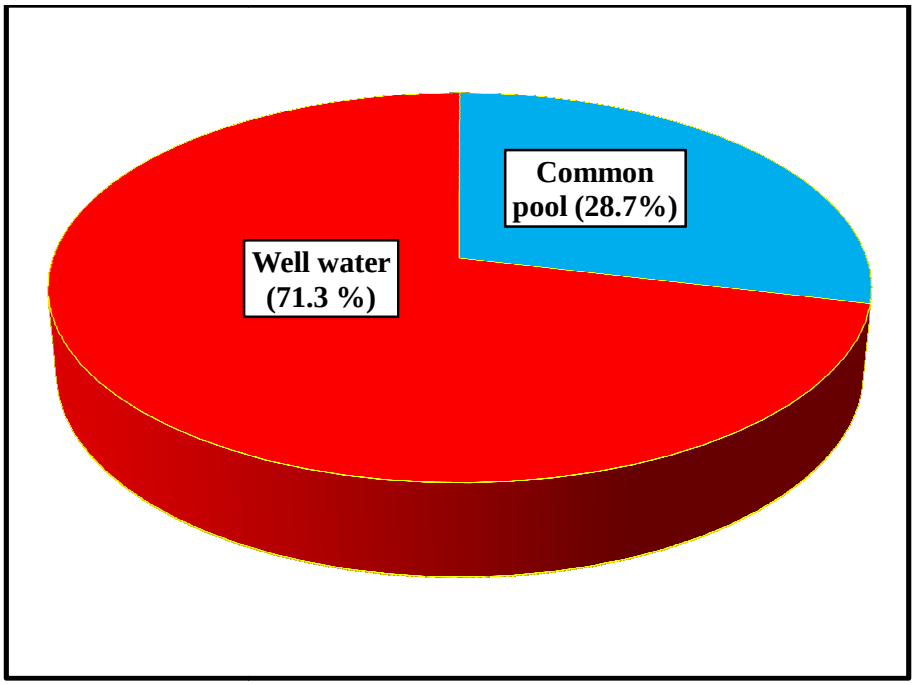
In this study all the patients except one bathed daily constituting 99.13%

Table-11: Distribution of patients based on bath source

Bath from where	Number	Percentage	p value
Common pool	33	28.70	**0.04**
Other sources	82*	71.30*	
Total	**115**	**100.00**	

(*p<0.05 significant compared common pool with well water)

Graph-5: Distribution of patients based on bath source



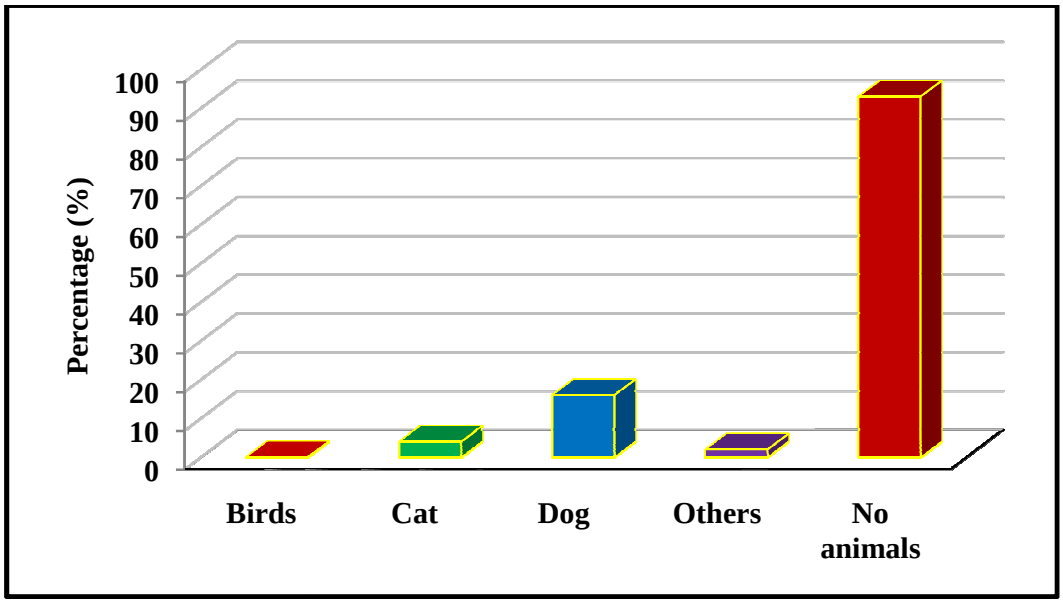
Above graph shows 71.30% of the patients used well water for taking bath and remaining 28.70% used common pool

Table-12: Distribution of patients based on type of pets present in home

Type of pets present in home	Number	Percentage
Birds	0*	0.00*
Cat	4*	3.48*
Dog	16*	13.91*
Others	2*	1.74*
No animals	93	80.87
Total	**115**	**100.00**

(*p<0.05 significant compared no animals with others)

Graph-6: Distribution of patients based on type of pets present in home



In this study 19.13 % had history of pets in their house. Dogs were the most common animal constituting 13.91% followed by cat which was 3.48% followed by other animals such as cow and goat which constituted 1.74%. 80.87% did not have history of any pets.

Table-13: Distribution of patients based on type of lesion

Type of lesion	Number	Percentage	p value
Macule	1*	0.87*	**0.04**
Patch	49	42.61	
Papule	0*	00.00*	
Pustule	0*	00.00*	
Others	36*	31.30*	
More than two type of lesion	29*	25.22*	
Total	**115**	**100.00**	

(*p<0.05 significant compared patch with others)

Scaly patch was the most common type of lesion found on examination in this study which was seen in 42.61% of the patients followed by annular plaque with papules seen in 31.30% of patients. Around 25.22% of patients had 2 types of lesions commonly being scaly plaque with papule and scaly patch together

Table-14: Distribution of patients based ring lesion

Discharge	Number	Percentage	p value
No	1	0.87	**0.02**
Yes	114*	99.13*	
Total	**115**	**100.00**	

(*p<0.05 significant compared no with yes)

In this study 99.13% of patients had ring lesion on examination.

Table-15: Distribution of patients based scaling

Discharge	Number	Percentage	p value
No	1	0.87	**0.02**
Yes	114*	99.13*	
Total	**115**	**100.00**	

(*p<0.05 significant compared no with yes)

In this study 99.13% of our patients had scaling on examination

Table-16: Distribution of patients based hyperpigmentation

Discoloration	Number	Percentage	p value
No	7	6.09	**0.02**
Yes	108*	93.91*	
Total	**115**	**100.00**	

(*p<0.05 significant compared no with yes)

In this study on examination, hyperpigmentation was present in 93.91% of our patients and remaining 6.09% of our patients did not have discoloration on examination.

Table-17: Distribution of patients based on serous discharge

Serous discharge	Number	Percentage	p value
No	102	88.70	**0.03**
Yes	13*	11.30*	
Total	**115**	**100.00**	

(*p<0.05 significant compared no with yes)

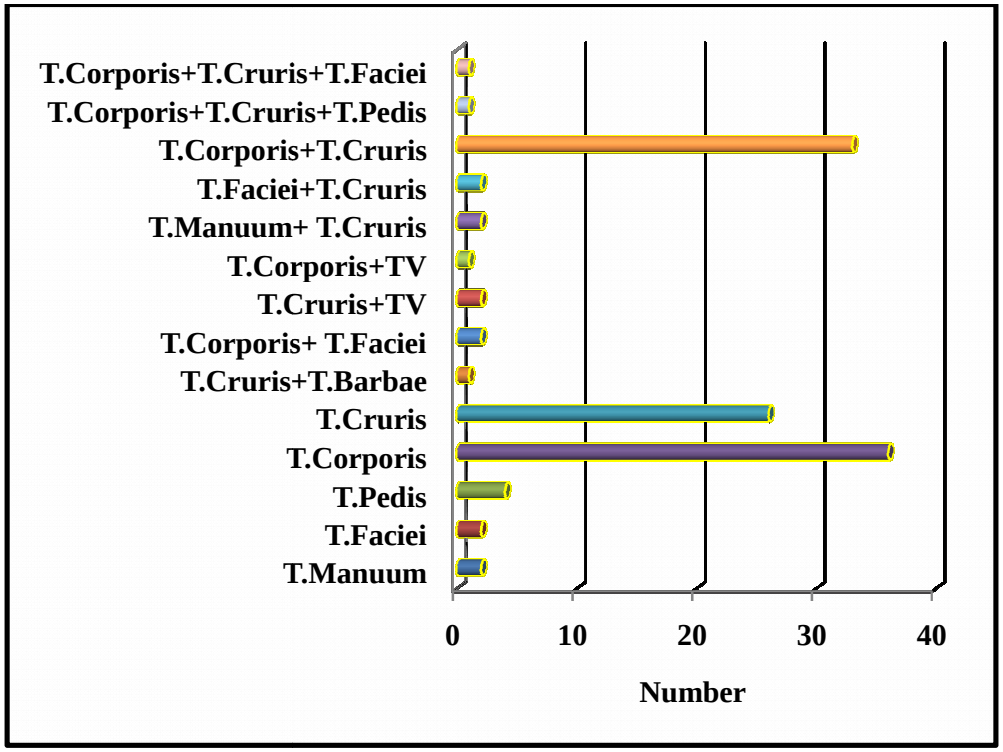
The above table shows that 11.30% of the patients had serous discharge and they were not blood stained or foul smelling. 88.70% of the patients did not have any discharge over the lesions on examination.

Table-18: Distribution of patients based on clinical diagnosis

Diagnosis	Number	Percentage	p value
T.Manuum	2*,#,$	1.74*,#,$	**0.02**
T.Faciei	2*,#,$	1.74*,#,$	
T.Pedis	4*,#,$	3.48*,#,$	
T.Corporis	36	31.30	
T.Cruris	26*	22.61*	
T.Cruris+T.Barbae	1*,#,$	0.87*,#,$	
T.Corporis+ T.Faciei	2*,#,$	1.74*,#,$	
T.Cruris+TV	2*,#,$	1.74*,#,$	
T.Corporis+TV	1*,#,$	0.87*,#,$	
T.Manuum+ T.Cruris	2*,#.$	1.74*,#,$	
T.Faciei+T.Cruris	2*,#,$	1.74*,#,$	
T.Corporis+T.Cruris	33*	28.70	
T.Corporis+T.Cruris+T.Pedis	1*,#,$	0.87*,#,$	
T.Corporis+T.Cruris+T.Faciei	1*,#,$	0.87*,#,$	
Total	**115**	**100.00**	

(*p<0.05 significant Tenia corporis with others, #p<0.05 significant compared Tinea cruris with others, $p<0.05 significant compared T.Corporis+T.Cruris with others)

Graph-7: Distribution of patients based on clinical diagnosis

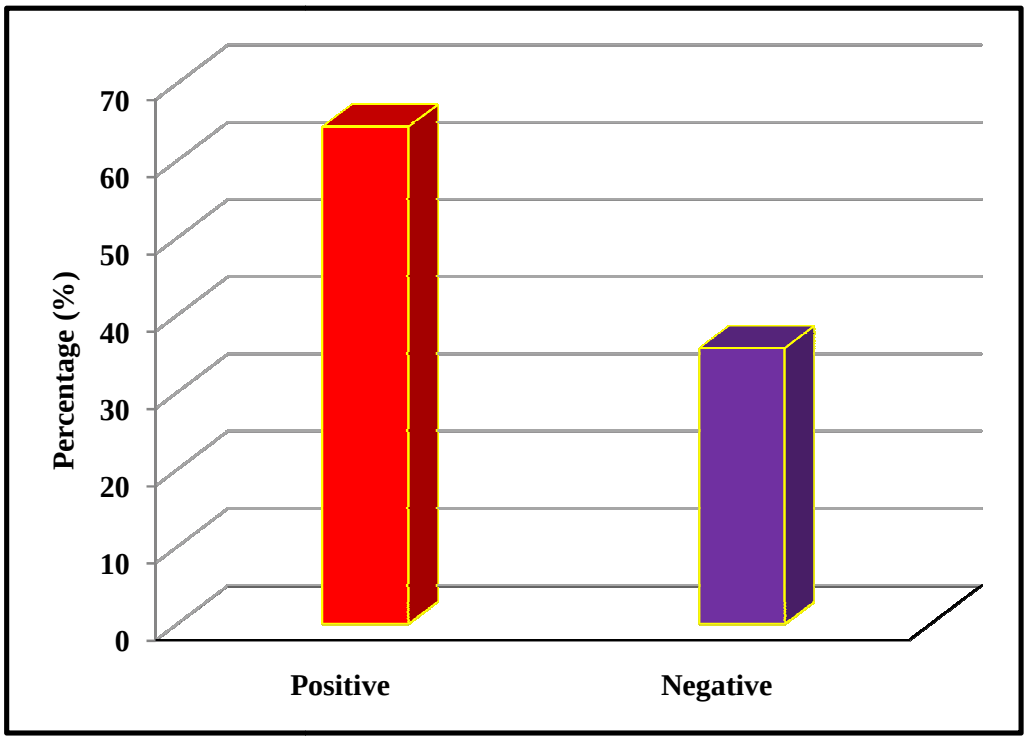


In this study most of the patients had Tinea corporis (32.17%) followed by combination of Tinea corporis and Tinea cruris (30.43%) followed by Tinea cruris (21.74%). Tinea cruris with Tinea faciei was seen in 4.30% of the patients. Tinea pedis was seen in 2.61% of patients Tinea faciei, Tinea manuum, Tinea corporis with Tinea versicolor each constituted around 1.74% of patients. Combination of Tinea manuum with Tinea cruris was seen in 0.87% and Tinea cruris with Tinea versicolor was also seen in 0.87% of patients.

Table-19: Distribution of patients based on KOH investigation

KOH investigation	Number	Percentage	p value
Positive	74	64.35	**0.04**
Negative	41*	35.65*	
Total	**115**	**100.00**	

(*p<0.05 significant compared positive with negative)



Graph-8: Distribution of patients based on KOH investigation

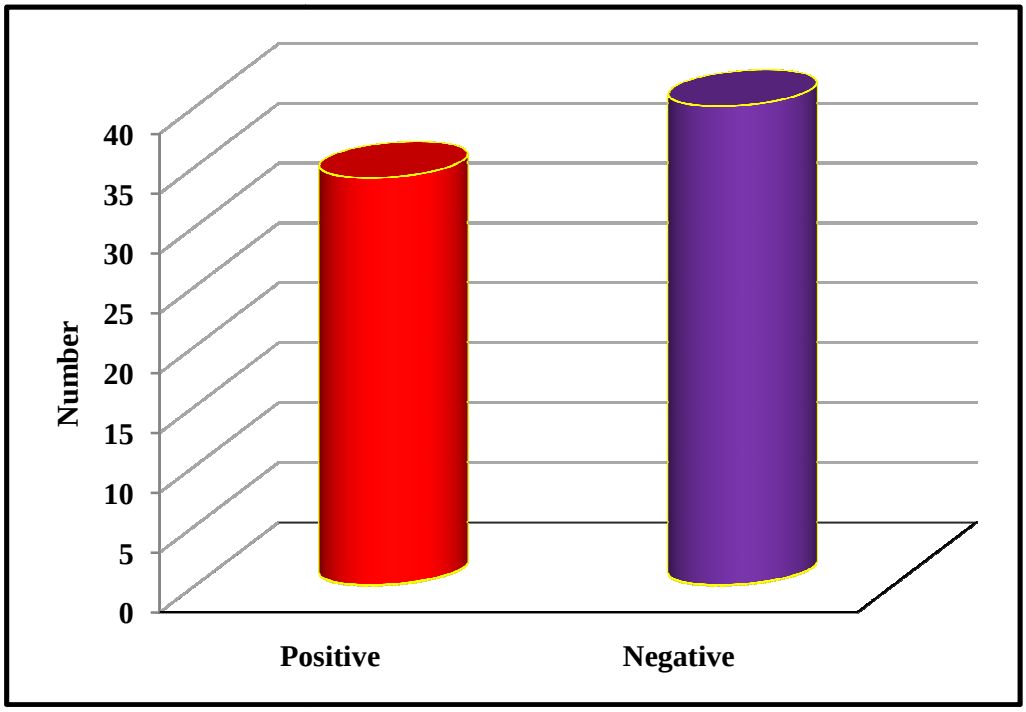
In 64.35% of the patients KOH microscopic examination was positive for fungal elements. In 35.65% KOH examination was negative

Table-20: Distribution of patients based on culture test

Culture test	Number	Percentage	p value
Positive	34	45.95	**0.04**
Negative	40*	54.05*	
Total	**74**	**100.00**	

(*p<0.05 significant compared positive with negative)

Graph-9: Distribution of patients based on culture test

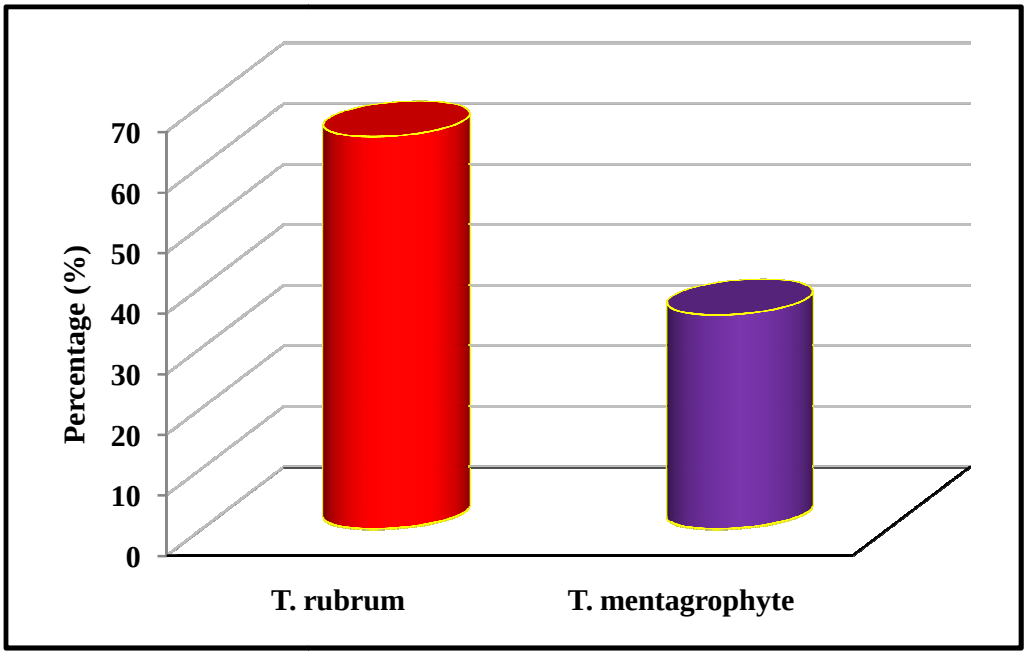


Among the patients in whom KOH microscopic examination was positive, 45.95% of the patients were culture positive and 54.05% of the patients were culture negative

Table -21: Distribution of patients based on type of organism

Type of organism	Number	Percentage	p value
T. rubrum	22	64.71	**0.04**
T. mentagrophyte	12*	35.29*	
Total	**34**	**100.00**	

Graph-10: Distribution of patients based on type of organism



T.rubrum was isolated in 64.71% of the patients and T. mentagrophyte was isolated in 35.29% of the patients.

Table -22: Comparison of number of patients based number, KOH and culture positive

Diagnosis	Number	KOH positive	Culture positive
T.Manuum	2	1	0
T.Faciei	2	0	0
T.Pedis	4	2	1
T.Corporis	36	20	6
T.Cruris	26	16	6
T.Cruris+T.Barbae	1	0	0
T.Corporis+ T.Faciei	2	2	1
T.Cruris+TV	2	0	0
T.Corporis+TV	1	0	0
T.Manuum+ T.Cruris	2	1	1
T.Faciei+T.Cruris	2	2	2
T.Corporis+T.Cruris	33	28	15
T.Corporis+T.Cruris+T.Pedis	1	1	1
T.Corporis+T.Cruris+T.Faciei	1	1	1
Total	**115**	**74**	**34**

Relationship between the clinical diagnosis, microscopy in potassium hydroxide and culture on sabourauds dextrose agar medium.

In this study of 115 patients, KOH positivity was observed in 74 patients (64.35%) and culture positivity in 24 cases (45.95%) out of the KOH positive patients.

Maximum number of tinea corporis patients showed KOH positivity and culture positivity.

Maximum KOH positivity and culture positivity in our study was seen in patients with both Tinea corporis and Tinea cruris.

Tinea corporis patients constituited totally 36 cases of which 20 (55.5%) were KOH positive and 6 (30%) was culture positive.

KOH and culture positivity in tinea cruris was also seen to a good extent showing 16 out of 26 (61.5%) and 6 out of 16 (37.5%) positivity respectively.

100% of patient with combination infection such as tinea pedis, tinea cruris and tinea corporis cases and combination of Tinea corporis, Tinea cruris and Tines faciei showed KOH positivity.

Table-23: Comparison of number of patients based KOH and culture positive and organism

Diagnosis	Number	KOH positive	Culture positive	T.rubrum positive	T.mentagrophyte Positive
T.Manuum	2	1	0	0	0
T.Faciei	2	0	0	0	0
T.Pedis	4	2	1	1	0
T.Corporis	36	20	6	5	1
T.Cruris	26	16	6	2	4
T.Cruris+T.Barbae	1	0	0	0	0
T.Corporis+ T.Faciei	2	2	1	0	1
T.Cruris+TV	2	0	0	0	0
T.Corporis+TV	1	0	0	0	0
T.Manuum+ T.Cruris	2	1	1	1	0
T.Faciei+T.Cruris	2	2	2	1	1
T.Corporis+T.Cruris	33	28	15	10	5
T.Corporis+T.Cruris +T.Pedis	1	1	1	1	0
T.Corporis+T.Cruris +T.Faciei	1	1	1	1	0
Total	**115**	**74**	**34**	**22**	**12**

Relationship between Clinical types and Etiological Agents

Among the KOH positive patients of tinea corporis, 30% was culture positive for dermatophytes out of which T. rubrum was isolated in 83.3% and T. mentagrophyte was isolated in 16.6%.

Among the 26 patients who were clinically diagnosed with tinea cruris, culture positivity was found in 6 cases giving it a 37.5% positivity. T. mentagrophytes, was the common isolate constituting 66.6% followed by T. rubrum in 33.3% of cases.

In patients with Tinea corporis and Tinea cruris, T. rubrum was the most common isolate than T. mentagrophyte.

T. rubrum was the isolate from patients with T. corporis, Tinea cruris with Tinea pedis and Tinea faciei.

Discussion

DISCUSSION

Superficial mycoses are common worldwide. They are believed to affect 20% to 25% of the world's population and the incidence continues to increase.[81]

The current study attempts to characterize the clinical and microbiological aspects of superficial dermatophytic infections in 115 consecutive patients presenting to a tertiary care hospital in Kanyakumari District between June 2015- June 2016.

Among the 115 patients diagnosed with dermatophytosis, our study demonstrated a female preponderance, accounting for 66.7% of the patients.

Dermatophytosis can affect every age group with no specific age group being immune to the infection. In our series, the age of the affected patients ranged from 10 years to 70 years. Although all age groups can be affected, the majority of patients in our study were in the 10 to 20 years age group accounting for 44.3% of the patients. This age group was closely followed by 21-40 years accounting for 14.7% of the patients. This again may be due to the fact that this group of patients is much more prone to infection due to greater mobility and the potential for contact with other patients. In a study done by Neetu Jain et al.[40] and Shukla et al. [47] they observed that the most common affected age group was 21-30 yeras of age. It is in concordance with study performed by Tony burns et al. [7] in which most cases belonged to the age group 11-20 years followed by 1-10 years

and demonstrated that most infections occur under the age of 20 years. Other studies[91-93] have found 21-30 years age group as the commonest group affected. Khare AK et al.[94] from Varanasi reported that tinea infection was more common in 11-20 years age group.

In this study, maximum number of patients were students (46.09%) followed by house wives (25.22%) and farmers constituted 3.48% of our patients. 90% of the student community were from our institution which included nursing, medical and dental, who were hostellers. This may be due to sharing of fomites. Apart from the student community (46.09%) remaining people are from rural population which included illiterate people of low socio economic group who are unaware of the disease, they neglected the initial lesions and did not take any treatment, hence presented with lesions at multiple sites.

Shyness to attend clinic is one of the factor for late presentation and chronicity of the lesions in some cases especially with female patients (our study has a female preponderance). 12.17% of our patients had a positive past history. Some of them had relapse and few had re-infection. Relapse could be due to inadequate treatment. Re-infection could have been contributed by sharing of fomites in the family. Of the 115 patients, 45.22% of the patients gave history of similar complaints in the family which is due to increased number of sharing of fomites such as towels, soap, clothing's etc among the family members. In the study, 43.48% of patients shared contaminated

towels, soaps, clothes, footwear and from other members in the residence and at work. More than 2 fomites were shared by 29.56% of patients. This high incidence of dermatophytic infestation among patients who shared fomites is similar to the study performed by C Grove et al. [95] where he concluded that 62% of the patients gave history of sharing of combs and hair accessories among each other. This confirms that dermatophyte infections are transmitted from person to person by sharing common house hold clothes and fomites. 99.13% of patients bathed daily of which 28.7% of patients took bath from common pool source. This explains the importance of educating the population regarding the use of common pools for bathing as a source of infection.

In this study, history of pets in the family was found in 19.13% of cases and the other 80.87% did not give any history of pets living with them. In the study done by Chander Groveret al. [95] it showed only 14% of the patients gave history of pets at home or prolonged contact with animals. [96] Some of the patients had closer association with pet animals such as cattle, dogs and cats. In a study done by Ndako et al. [44] they concluded that dermatophytes occurred more in children with greater propensity for play, interaction with domestic animals.

In this study maximum number of patients had a diagnosis of tinea corporis with lesions occurring in more than 1 site in 44.35% of the patients. Lesions were present in the groin in 27.83% of the patients. Lesions over the back and lower limb were present each in 4.35% of the patients. Lesions in

the axilla, buttocks were in 3.48% of patients individually on both sites. Inframammary area, abdomen, waist area, face each constituted 2.61% of the lesions. 1.74% of the patients had lesion only in the upper limb.

Tinea corporis was the most common clinical diagnosis made. 36 of the 115 patients (31.30%) studied were diagnosed with tinea corporis. This was found by itself and also in combination with other lesions including tinea cruris, tinea mannum and tinea pedis. This observation is similar to other studies done by Kennedy Kumar et al.[97] where, out of 117 patients, tinea corporis accounted for 70.8 % (82 cases) followed by tinea cruris 18.8% (22 cases). T. rubrum was the most common etiological agent in 45 cases (67.5%). In a study done by Jha BK et al.[39] he found tinea corporis to be the most common clinical diagnosis seen in 31.4% of the patients followed by tinea capitis in 20.3% of the patients. In a study done by Neetu Jain et al [40] tinea corporis was the most common clinical type in all age group.

In this study, 21.74% of the cases were tinea cruris. Dermatophytes occur more commonly in groin and waist due to poor aeration due to tight clothing, maceration and high rate of sweating.[98] Recurrence and chronicity were observed to be more frequent in tinea corporis and tinea cruris

Tinea faciei was seen in 1.74% of the patients. 3.48 % of the patients presented with tinea pedis and 1.74% of the patients had tinea manuum. In a study done by Shukla et al. [47] it was observed that tinea pedis was seen in 2% of the patients and tinea manuum was seen in 1.5% of the patients.

In the study conducted by Singh S et al.[12] the predominance of tinea pedis in western countries could be because of regular use of shoes and socks, predisposing to perspiration and maceration.

Direct microscopy by KOH examination is a commonly used modality to visualize and characterize the superficial mycoses. Although the yield of diagnosis is high, it could still be negative in a significant percent of patients and also falsely negative in 5% - 15 % of the patients.[66] Though direct microscopy is an easy and reliable test, 5-10% of false negative results may occur because,

- Inappropriate material or an insufficient quantity was obtained for analysis
- Out dated or defective KOH used.
- Inadequate time was spent on examining the specimen.

The KOH positivity also appears to be affected by the site of infestation. In our study 64.35% of the total patients examined were positive by microscopy. In a study done by Bhavar et al.[45] they found that 68.16% of the patients were KOH positive. In a study done by Parut Patel et al.[49] 62.12% were KOH positive.

Microbiological confirmation of the species causing dermatophytosis is a very important adjunct in diagnosing superficial fungal infections. Dermatophytes are cultivated on artificial media containing an organic source of nitrogen. Sabouraud's dextrose agar containing dextrose, peptone and agar

is used. Emmon modified this medium by increasing the PH from 5.6 to 6.8-7.0 and reducing the percentage of dextrose from 4 to 2 (Neutral Sabouraud's dextrose agar). With addition of Chloramphenicol (500 mg) in one litre, this medium becomes selective for isolation of dermatophytes. Culture helps in species identification.

However the microbiological confirmation in our study could be obtained only in 45.95% of the patients. This percentage positivity is similar to those obtained in other studies. In a study done by Bindu V et al. [99] in Calicut they observed culture positivity in 45.3% of the patients. This low rate of culture positivity could be due to inadequate sample, prior treatment or may just reflect the fastidious needs of the offending organism.

T.rubrum was the most commonest species identified on culture being positive by 64.71%, this was followed by T. mentagrophyte which was positive in 35.29% of patients. This is on par to other studies where T. Rubrum has been the most common isolate. Most studies from India however reported Trichophyton rubrum as the commonest isolates.[39,40,43,45,100]

The site of infection also had an effect on the species that could be identified, eg. In tinea corporis, T.rubrum was the commonest organism. In tinea cruris T. mentagrophyte is the most common isolate.

In summary, although microbiological confirmation is important for both diagnosis and a guide to therapy, a definite diagnosis can be reached only in less than half number of patients.

TINEA CORPORIS

TINEA MANUUM

EXTENSIVE TINEA CORPORIS

TINEA PEDIS

TINEA PEDIS

TINEA FACIEI

PLAQUE LESION OF TINEA CORPORIS

KOH EXAMINATION

KOH EXAMINATION

Refractile branched septae seen in KOH

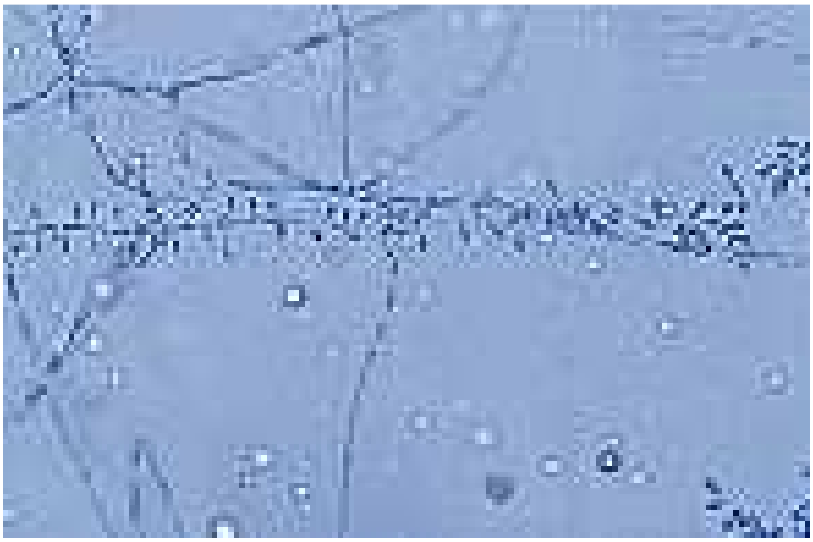
KOH EXAMINATION

TRICH OPHYTON RUBRUM

Reverse deep red colony seen

LACTOPHRNOL COTTON BLUE MOUNT

TRICHOPHYTON RUBRUM



TRICHOPHYTON MENTAGROPHYTE

Flat creamy white colonies with yellow reverse seen

LACTOPHRNOL COTTON BLUE MOUNT

TRICHOPHYTON MENTAGROPHYTE

Conclusion

CONCLUSION

This study comprises of 115 patients who presented to the OPD of Dermatology, Venereology & Leprosy of Sree Mookambika Institute of Medical Sciences who were clinically diagnosed as dermatophytosis from June 2015- June 2016. Here in our study females outnumbered male.

The commonest age group affected was 10 – 20 years of age

It was observed that most of the patients were from the no income group as majority of our patient were students (46.09%) and house wives (25.22%).

All the patients had complaints of itching.

In this study, 60.87% of the patients had itching and lesion for a duration of more than 1 month.

In this study, 43.48% of the patients had history of sharing of fomites.

In this study, 12.17% of the patients had a past history of similar complaint in the last one year.

About 45.22% of the patients had a history of similar complaints in the family members at the time of presentation in our OPD.

In our study, 99.13% of the patients bathed daily and remaining 0.87% of the patients bathed once in 2 days.

It was observed that 71.30% of the patients used well water for taking bath and remaining 28.70% used common pool.

In this study, 19.13 % had history of pets in their house. Dogs were the most common animal constituting 13.91% followed by cat which was 3.48% followed by other animals such as cow and goat which constituted 1.74%. 80.87% did not have history of any pets.

In this study, maximum number of patients had a diagnosis of tinea corporis with lesions occurring in more than 1 site in 44.35% of the patients. Lesions were present in the groin in 27.83% of the patients.

Scaly patch was the most common type of lesion found on examination in this study which was seen in 42.61% of the patients followed by annular plaque with papules seen in 31.30% of patients. Around 25.22% of patients had 2 types of lesions commonly being scaly plaque and scaly patch together.

In this study, on examination, hyperpigmentation was present in 93.91% of our patients and remaining 6.09% of our patients did not have discoloration on examination.

In this study, 11.30% of the patients had serous discharge on examination and they were not blood stained or foul smelling. 88.70% of the patients did not have any discharge over the lesions on examination.

In this study, most of the patients had Tinea corporis (32.17%) followed by combination of Tinea corporis and Tinea cruris (30.43%) followed by Tinea cruris (21.74%).

In 64.35% of the patients KOH microscopic examination was positive for fungal elements.

Among the patients in whom KOH microscopic examination was positive, 45.95% of the patients were culture positive.

Maximum number of tinea corporis patients showed KOH positivity and culture positivity.

Maximum KOH positivity and culture positivity in our study was seen in patients with both Tinea corporis and Tinea cruris.

Tinea corporis patients constituted totally 36 cases of which 20 (55.5%) were KOH positive and 6 (30%) was culture positive. T. rubrum was isolated in 83.3%.16.6% grew T. mentagrophyte.

Among the 26 patients who were clinically diagnosed with tinea cruris, culture positivity was found in 6 cases giving it a 37.5% positivity. T. mentagrophytes, was the common isolate constituting 66.6% followed by T. rubrum in 33.3% of cases.

This study proves that sharing of fomites, bathing in common pool and pets at home have role in spread of superficial dermatophytic infections of the skin. This can be proved in large studies in future.

Summary

SUMMARY

1. In this present study, it was observed that majority of the patients were females (54.78%) and males comprised the rest of the patients (45.22%)
2. Majority of patients diagnosed were in the age group of 10-20 years (44.3%) followed by 21-40 years of age.
3. Most of the patients were students (46.09%) and housewives (25.22%) with itching as most common clinical presentation.
4. About 12.17% of the patients had past history of dermatophytosis within the last one year.
5. Family history was present in 45.22% of the patients.
6. In the study, 43.48% had a history of sharing fomites including towels, soaps, footwear. Sharing of more than two fomites was present in 29.56% of our patients.
7. In this study, 28.70% used common pool as a source of bathing and 71.30% of our patients used well water.
8. It is observed that 19.13 % had history of pets in their house and dogs were present in 13.91% of patients.
9. On examination, scaly patches were the most common presentation (42.61%) followed by hyperpigmented plaques with papules (25.22%).
10. Tinea corporis was the most common clinical diagnosis (32.17%) followed by a combination of tinea corporis and tinea cruris (30.43%).

11. Fungal elements on direct microscopic examination with KOH was present in 64.35% of the patients.
12. Microbiological cultures were positive in only (45.95%) of the patients and all these patients showed positivity by direct microscopy.
13. T. rubrum (64.71%) was the most common species isolated followed by T.mentagrophyte (35.29%).

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Appendices

SREE MOOKAMBIKA INSTITUTE OF MEDICAL SCIENCES
KULASEKHARAM

RESEARCH COMMITTEE

CERTIFICATE

This is to certify that the Research Protocol Submitted

by .....Arishta Bala.....

~~*Faculty*~~ */ Post Graduate from Department of* .Dermatology, Venereology & Leprology..... *Titled* "Study of the pattern of Superficial dermatophytic infection of the skin"

is approved by the Research Committee.

27/1/15

Chair Person

Prof. & H.O.D.
Dept. of Bio-Chemistry
Sree Mookambika Institute of Medical Sciences
Kulasekharam 629 161

Convenor

Prof. & H.O.D.
Dept. of Physiology
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Date : 27/1/15

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Institutional Human Ethics Committee

Registered under CDSCO with Reg No. ECR/446/Inst/TN/2013

Ref. No. SMIMS/IHEC/2015/A/05 **Date: 10th April 2015**

Certificate

This is to certify that the Research Protocol Ref. No. **SMIMS/IHEC/2015/A/05**, entitled "Study of The Pattern of Superficial Dermatophytic Infections of The Skin" submitted by Dr. Arishta Bala, Postgraduate of Department of Dermatology, Venereology and Leprology, SMIMS has been approved by the Institutional Human Ethics Committee at its meeting held on 13th of March 2015.

[This Institutional Human Ethics Committee is organized and operates according to the requirements of ICH-GCP/GLP guidelines and requirements of the Amended Schedule-Y of Drugs and Cosmetics Act, 1940 and Rules 1945 of Government of India.]

10/4/15

Dr. Rema Menon. N
Member Secretary
Institutional Human Ethics Committee
Professor of Pharmacology and HOD
SMIMS, Kulasekharam [K.K District]
Tamil Nadu -629161

CONSENT FORM

PART 1 OF 1

INFORMATION FOR PARTICIPANTS OF THE STUDY

Dear Volunteers,

We welcome you and thank you for your keen interest in participating in this research project. Before you participate in this study, it is important for you to understand why this research is being carried out. This form will provide you all the relevant details of this research. It will explain the nature, the purpose, the benefits, the risks, the discomfort, the precautions and the information about how this project will be carried out. It is important that you can read and understand the contents of the form carefully. This form may contain certain scientific terms and hence, if you have any doubts or if you want more information, you are to ask the study personnel or the contact person mentioned below before you give your consent and also at any time during the entire course of the project.

1. Name of the Principal Investigator	**:**	Dr. Arishta Bala Postgraduate-M.D DVL Sree Mookambika Institute of Medical Sciences, Kulaseharam
2. Name of the Guide	**:**	Dr. Murugan. S Professor and HOD Department of DVL Sree Mookambika Institute of Medical Sciences, Kulasekharam
3. Name of the co-guide	**:**	Dr. Padma Prasad. M. K. Associate Professor Department of DVL Sree Mookambika Institute of Medical Sciences, Kulasekharam Dr. Palaniappan. M Professor Department of Microbiology Sree Mookambika Institute of Medical Sciences, Kulasekharam.
4. Institute: details with Address	**:**	Sree Mookambika Institute of Medical Sciences, Kulasekharam, Kanyakumari District-629161 Tamil Nadu.

5. Title of the study:

"Study of Pattern of Superficial Dermatophytic Infections of the Skin"

6. Background Information:

Dermatophytes are a group of fungal infection affecting skin, hair and nail.[1] Ringworm is a very common superficial fungal skin infection in hot and humid climates like India.[8] Ring worm is a serious public health problem among children, adolescents and adults and also causes significant cosmetic problems.[9,10]

7. Aims and Objectives

1. To study the pattern of superficial dermatophytic infection of the skin in relation to demographic factors.
2. To find out the causative fungal organism
3. To find identify the factors in transmission of superficial dermatophytic infections of the skin.

8. Scientific justification of the study:

Dermatophytosis is a common fungal infection which is neglected by whole sections of population with patients seeking medical attention mainly for cosmetic reasons and to a lesser extent due to the discomfort. Infection from animal species has become quite common due to the prevalence of fungal infection among pet animals.

There are only few studies that examine the various patterns of superficial fungal infections in south India.

9. Procedure of the study:

After getting the consent, a detailed history will be taken from the patient. A detailed clinical examination will be done. If clinical features suggestive of superficial fungal infection are present, scraping from the border of the lesion will be taken and the scraping will be sent for microbiological examination.

10. Expected risk of the participants: No risk

11. Expected Benefits of the Research for the participants: helps in early diagnosis and instituting preventive measures for superficial fungal infection.

12. Maintenance of confidentiality: All data collected for the study will be kept confidentially. No personal details will be revealed.

13. Why have I been chosen to be in this study: Clinical features of superficial fungal infection are present.

14. How many people will be in the study: 113

15. Agreement of compensation to the participants: No

16. Anticipated prorated payment, if any, to the participants of the study: Nil

17. Can I withdraw from study at any time during the study period: Yes

18. If there is any new finding/ information , would I be informed: Yes

19. Expected duration of the participants participation in the study: Single visit

20. Any other pertinent information: No

21. Whom do I contact for further information

For any study related queries, you are free to contact

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Place:

Date:

Signature of Principal Investigator **Signature of Participant**

CONSENT FORM (>18 years)

PART 2 OF 2

PARTICIPANTS CONSENT FORM

The details of the study have been explained to me in writing and details have been fully explained to me. I am aware that the results of the study may not be directly beneficial to me but will help in the advancement of medical sciences. I confirm that I have understood the study and had the opportunity to ask questions. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reasons, without the medical care that normally be provided by the hospital being affected. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). I have given details of the study. I fully consent to participate in the study titled "Study of Pattern of Superficial Dermatophytic Infections of the Skin".

Serial no/Reference no:

Name of the participant:

Address of the Participant:

Contact number of the Participant:

Signature/Thumb impression of the participant/Legal guardian

Witness

1.

2.

Date:

Place:

CONSENT FORM (8 - 18 years)

PART 2 OF 2

PARTICIPANTS CONSENT FORM

The details of the study have been explained to me in writing and details have been fully explained to me. I am aware that the results of the study may not be directly beneficial to me but will help in the advancement of medical sciences. I confirm that I have understood the study and had the opportunity to ask questions. I understand that my participation in the study is voluntary and that I am free to withdraw at any time, without giving any reasons, without the medical care that normally be provided by the hospital being affected. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). I have given details of the study. I fully consent to participate in the study titled "Study of Pattern of Superficial Dermatophytic Infections of the Skin".

Serial no/Reference no:

Name of the participant:

Name of the Father/Mother :

Address of the Participant:

Contact number of the Parent/Guardian:

Signature/Thumb impression of the Parent/Legal guardian :

Signature/Thumb impression of the participant :

Witness

1.
2.

Date:

Place:

CONSENT FORM (0-7 years)

PART 2 OF 2

PARTICIPANTS CONSENT FORM

The details of the study have been explained to me in writing and details have been fully explained to me. I am aware that the results of the study may not be directly beneficial to my child but will help in the advancement of medical sciences. I confirm that I have understood the study and had the opportunity to ask questions. I understand that my child's participation in the study is at my consent and that I am free to withdraw my child at any time, without giving any reasons, without the medical care that normally be provided by the hospital being affected. I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s). I have given details of the study. I fully consent for my child to participate in the study titled "Study of Pattern of Superficial Dermatophytic Infections of the Skin".

Serial no/Reference no:

Name of the Parent/Legal Guardian:

Address of the Parent/Legal Guardian:

Contact number of the Parent/Legal Guardian:

Signature/Thumb impression of the Parent/Legal guardian

Witness

1.
2.

Date:

Place:

PROFORMA

NAME :

AGE :

SEX : MALE ☐ FEMALE ☐

OCCUPATION : FARMER ☐ COOLIE ☐

STUDENT ☐ HOUSEWIFE ☐

PROFESSIONAL ☐ BUSINESS ☐

OTHERS ☐

O.P NO : DATE :

EDUCATIONAL STATUS : ILLITERATE ☐

UNDERGRADUATE ☐

POSTGRADUATE ☐

MONTHLY INCOME : NO INCOME ☐ IN 100 ☐ IN 1000 ☐

ADDRESS : URBAN ☐ RURAL ☐

INFORMANT :

MAJOR COMPLAINTS :

1. ITCHING YES ☐ NO ☐
2. DURATION:
   SITE:
3. DISCOLOURATION YES ☐ NO ☐
   SCALING YES ☐ NO ☐
3. OOZING YES ☐ NO ☐
4. PAIN YES ☐ NO ☐

SIMILAR EPISODE IN THE PAST

IF YES, WHEN WAS THE LAST EPISODE:

HOW MANY EPISODE IN LAST ONE YEAR DURATION:

SIMILAR CASES IN FAMILY YES ☐ NO ☐

SHARING OF FOMITES AMONG FAMILY MEMBERS:

YES ☐ NO ☐

IF YES (1) TOWEL ☐

(2) SOAP ☐

(3) CLOTHING ☐

(4) RAZOR ☐

(5) FOOT WEAR ☐

(6) OTHERS – SPECIFY:

BATHING HABITS

(1) FREQUENCY OF BATHING :

(i) DAILY ☐

(ii) ON ALTERNATE DAYS ☐

(iii) ONCE IN THREE DAYS ☐

(iv) WEEKLY ONCE ☐

(2) FROM WHERE:

(i) COMMON POOL ☐

(ii) TAP WATER ☐

PETS IN THE FAMILY

YES ☐ NO ☐

IF YES, SPECIFY: (1) DOG ☐ (2) CAT ☐ (3) BIRDS ☐

(4) OTHERS- SPECIFY : .....

LESIONS:

GENERAL :

SITE AFFECTED :

(1) HEAD ☐

(2) FACE ☐

(3) AXILLA ☐

(4) INFRAMAMMARY ☐

(5) ABDOMEN ☐

(6) BACK ☐

(7) UPPERLIMB ☐

(8) WAIST AREA ☐

(9) GROIN ☐

(10)LOWER LIMB ☐

(11) BUTTOCKS ☐

DESCRIPTION OF THE LESION :

MACULE ☐ / PATCH ☐ / PAPULE ☐ / PUSTULE ☐ / OTHER ☐

RING LESION YES ☐ NO ☐

SCALING YES ☐ NO ☐

DISCOLOURATION YES ☐ NO ☐

IF YES, HYPERPIGMENTED ☐ / HYPOPIGMENTED ☐

DISCHARGE YES ☐ NO ☐

IF YES, COLOUR OF DISCHARGE-

CONSISTENCY :

BLOOD STAINED : YES ☐ NO ☐

FOUL SMELLING : YES ☐ NO ☐

INVESTIGATIONS :

KOH :

CULTURE :

LCB MOUNT :

FINAL DIAGNOSIS:

LIST OF ABBREVATIONS USED

mm	-	Millimetre
nm	-	Nanometre
DHT	-	Delayed hypersensitivity
IH	-	Immediate hypersensitivity
mg	-	Milligram
KOH	-	Potassium hydroxide
OPD	-	Out patient department
LCB	-	Lactophenol cotton blue
mg	-	Milligram
g	-	Gram
kg	-	Kilogram
E.flocossum	-	Epidermophyton flocossum
T.concentricum	-	Trichophyton concentricum
M.ferrugineum	-	Microsporum ferrugineum
M.audouinii	-	Microsporum audouinii
T.gourvilii	-	Trichophyton gourvilii
T.mentagrophyte	-	Trichophyton mentagrophyte
T.rubrum	-	Trichophyton rubrum
T.schoenleinii	-	Trichophyton schoenleinii
T.soudanense	-	Trichophyton soudanense
T.tonsurans	-	Trichophyton tonsurans

T.violaceum	-	Trichophyton violaceum
T.yaoundei	-	Trichophyton yaoundei
M.canis	-	Microsporum canis
M.gallinae	-	Microsporum gallinae
M.persicolor	-	Microsporum persicolor
T.equinum	-	Trichophyton equinum
T.simii	-	Trichophyton simii
M.cookie	-	Microsporum cookie
M.gypseum	-	Microsporum gypseum
M.fulvum	-	Microsporum fulvum
M.nanum	-	Microsporum nanum
M.praecox	-	Microsporum praecox
M.vanbreuseghemii	-	Microsporum vanbreuseghemii
T. Corporis	-	Tinea corporis
T. Cruris	-	Tinea cruris
T. Pedis	-	Tinea pedis
T. Manuum	-	Tinea manuum
T. Faciei	-	Tinea faciei
T.V	-	Tinea versicolor

MASTER CHART

S.No	Age	Sex	OP.NO	Occupation	Education	Income	Area of living	Itching	Duration	Pain	Past h/o	Family h/o	Sharing	Bathing	Source	Pets
1	17	0	16108738	3	2	0	2	1	2- 3 weeks	0	0	1	1,2	1	1	0
2	13	0	16109470	3	2	0	2	1	2- 3 m	0	0	1	1,2	1	2	0
3	19	0	16105495	3	2	0	2	1	2 m	0	0	0	0	1	2	0
4	54	0	14217311	2	1	1	2	1	2 days	0	0	0	0	1	1	0
5	45	0	16019151	6	3	2	2	1	1 m	0	1	1	0	1	2	0
6	43	0	16081732	Autodriver	2	2	2	1	1 m	0	0	1	1,2	1	2	0
7	20	0	16076081	3	2	0	2	1	2-3 weeks	0	0	1	0	1	1	2
8	25	0	16068983	5	3	2	1	1	3 m	0	0	1	2	1	2	0
9	26	0	16024979	skilled labourer	2	1	2	1	1 m	0	1	0	0	1	1	3
10	22	0	16050851	3	2	0	1	1	1 weeks	0	1	0	0	1	2	0
11	12	0	15215060	3	2	0	2	1	1 m	0	1	0	1	1	2	0
12	18	0	16103777	3	2	0	2	1	2 m	0	0	0	0	1	2	0
13	24	0	16105939	5	3	2	1	1	10 days	0	0	0	0	1	1	0
14	16	0	16055943	3	2	0	2	1	1 week	0	0	1	1,2	1	2	0
15	20	0	16088763	3	2	0	2	1	1 m	0	0	1	0	1	1	3
16	22	0	160166174	3	2	0	2	1	6 m	0	0	0	1,2	1	2	0
17	52	0	259843	1	1	1	2	1	1 m	0	0	0	0	1	1	0
18	14	0	16108779	3	2	0	2	1	3 weeks	0	0	1	0	1	2	0
19	16	0	16108786	3	2	0	2	1	2 weeks	0	0	0	0	1	1	2
20	14	0	16034993	3	2	0	2	1	3 m	0	0	1	1,2	1	2	3
21	14	0	16013445	3	2	0	2	1	2 weeks	0	0	1	1,2	1	1	0
22	15	0	16011683	3	2	0	2	1	2 weeks	0	0	1	1	1	1	0
23	40	0	16010541	Barber	1	1	2	1	2 m	0	0	0	0	1	1	0

24	17	0	16008098	3	2	0	2	1	1 m	0	0	0	1,2	1	1	3
25	41	0	15220828	2	1	1	2	1	2 m	0	0	1	2	1	1	3
26	22	0	16039046	3	2	0	2	1	1 m	0	0	1	2	1	2	0
27	16	0	1611642	3	2	0	2	1	6 m	0	0	1	2	1	2	3
28	14	0	16105918	3	2	0	2	1	2 m	0	0	1	0	1	2	0
29	20	0	15091730	3	2	0	2	1	1 m	0	0	1	0	1	2	0
30	10	0	16106652	3	2	0	2	1	3 m	0	0	0	0	1	1	0
31	15	0	15196418	3	2	0	2	1	2- 3 weeks	0	0	0	1,2	1	1	0
32	15	0	16097165	3	2	0	2	1	3-4 m	0	0	1	1,2	1	2	0
33	45	0	16063134	6	3	2	1	1	3 m	0	0	0	0	1	2	0
34	40	0	16007638	2	1	1	2	1	1 year	0	0	0	2	1	1	0
35	22	0	1609006	3	2	0	2	1	2 weeks	0	0	0	0	1	2	0
36	18	0	16065285	3	2	0	2	1	2-3 m	0	0	1	0	1	1	0
37	37	0	16064594	Driver	2	2	2	1	1 year	0	0	0	1,2	1	1	0
38	16	0	160641528	3	2	0	2	1	4 m	0	0	1	1,2	1	1	3
39	30	0	16049385	2	1	1	2	1	2 m	0	0	0	1,2	1	1	3
40	11	0	13203649	3	2	0	2	1	1 m	0	0	0	1,2	1	1	0
41	36	0	16065349	6	3	2	1	1	1 m	0	0	0	0	1	2	0
42	46	1	16109471	4	1	0	2	1	1 m	0	0	1	1,2	1	2	0
43	20	1	16023391	3	2	0	2	1	2 weeks	0	1	0	0	1	2	0
44	19	1	16051539	3	2	0	2	1	1 m	0	1	1	0	1	2	0
45	52	1	16097166	Teacher	2	2	2	1	3-4 m	0	0	1	1,2	1	2	0
46	17	1	16085110	3	2	0	2	1	3 m	0	0	0	0	1	2	0
47	47	1	16085166	4	1	0	2	1	1 1/2 m	0	0	1	0	1	2	0
48	27	1	16085121	4	1	0	2	1	3 days	0	1	1	1,2	1	1	0
49	38	1	1606427	2	1	1	2	1	6 m	0	0	1	1,2	1	1	3

50	19	1	16089410	3	2	0	2	1	2 weeks	0	1	0	0	1	2	0
51	17	1	1606608	3	2	0	1	1	1week	0	0	0	0	1	2	0
52	33	1	16109427	4	1	0	2	1	1 m	0	0	0	1,2	1	2	3
53	45	1	16110198	4	1	0	2	1	2 m	0	0	0	0	1	1	0
54	18	1	160999379	3	2	0	2	1	3 weeks	0	1	0	0	1	2	0
55	55	1	16109458	4	1	0	2	1	1m	0	0	0	0	1	1	0
56	12	0	16116765	3	2	0	2	1	2m	0	0	0	1,2	1	2	2
57	55	0	16112340	6	3	2	1	1	1 week	0	0	0	2	1	2	3
58	64	1	16114527	6	3	2	1	1	2 weeks	0	0	0	0	1	1	0
59	33	1	1610873	5	3	2	1	1	1m	0	0	1	0	1	2	3
60	19	1	16109467	3	2	0	1	1	1 year	0	1	1	0	1	2	0
61	56	1	14200283	1	1	1	2	1	1 m	0	0	1	1,2	1	2	0
62	20	1	16109487	3	2	0	2	1	1 year	0	1	1	0	1	2	0
63	53	1	16021219	4	2	0	1	1	1 m	0	0	0	1,2	1	1	0
64	41	1	16021182	4	2	0	2	1	`1 m	0	0	1	1	1	2	0
65	16	1	16020484	3	2	0	1	1	1 m	0	0	1	1,2	1	2	0
66	17	1	16019775	3	2	0	2	1	2 m	0	0	0	0	1	2	0
67	20	1	16039838	3	2	0	2	1	10 days	0	0	1	3	2	2	0
68	48	1	16042173	4	2	0	2	1	2 m	0	0	0	0	1	2	0
69	42	1	16055633	4	1	0	2	1	6 m	0	0	0	0	1	2	0
70	43	1	16108739	4	1	0	2	1	1 week	0	0	1	1,2	1	2	0
71	37	1	1601434	4	2	0	1	1	5 m	0	0	1	1,2	1	2	0
72	33	1	16108731	4	1	0	2	1	1 week	0	0	1	0	1	2	0
73	38	1	16015500	4	2	0	2	1	3 m	0	0	0	2	1	2	0
74	28	1	16098745	3	2	0	2	1	3 days	0	0	0	0	1	2	0
75	65	1	15220868	4	1	0	1	1	4 m	0	0	0	1	1	2	0

76	18	1	16106607	3	2	0	2	1	1 week	0	0	0	0	1	2	0
77	18	1	16106609	3	2	0	2	1	1 m	0	0	0	0	1	2	0
78	36	1	16105919	4	2	0	2	1	1 m	0	0	1	0	1	2	0
79	63	1	1689761	2	1	1	1	1	6m	0	1	0	0	1	1	0
80	18	1	16058063	3	2	0	2	1	2 m	0	0	1	0	1	2	0
81	17	1	16016190	3	2	0	2	1	3 m	0	0	1	1,2	1	2	0
82	48	1	16096388	4	2	0	1	1	3 m	0	0	1	1,2	1	2	3
83	19	1	16089140	3	2	0	1	1	2 m	0	0	0	0	1	2	0
84	45	1	16090495	4	2	0	1	1	2 m	0	0	1	1	1	2	0
85	39	1	15185567	tailor	2	1	2	1	1 week	0	0	0	1,2	1	2	0
86	54	1	16047899	tailor	2	1	2	1	6 m	0	0	0	2	1	2	0
87	60	1	14039722	4	2	0	1	1	2 weeks	0	0	0	1,2	1	2	2
88	20	1	16111674	3	2	0	2	1	2 m	0	0	1	0	1	2	0
89	22	1	16059493	lad tech	2	2	2	1	1 m	0	0	0	0	1	2	0
90	49	1	16059488	4	2	0	1	1	1m	0	0	0	0	1	1	0
91	20	1	16058802	4	2	0	1	1	1 m	0	0	1	0	1	2	0
92	20	1	16058804	4	1	0	1	1	2 -3 weeks	0	0	0	0	1	2	0
93	18	1	15175221	4	1	0	2	1	2 weeks	0	0	0	0	1	2	0
94	30	1	15149270	4	1	0	2	1	1 week	0	0	1	0	1	2	3
95	22	1	16049055	lad tech	2	2	2	1	2 m	0	0	0	0	1	2	4(goat)
96	20	1	16058792	Comp staff	2	2	1	1	1 m	0	0	0	0	1	2	0
97	19	1	16031504	3	2	0	2	1	1 m	0	0	0	0	1	2	0
98	36	1	16042185	4	1	0	2	1	1 m	0	0	0	0	1	2	0
99	27	1	15220828	4	1	0	2	1	2- 3 weeks	0	1	1	0	1	2	3
100	25	1	16011225	2	1	1	1	1	3 m	0	0	1	0	1	2	0
101	31	1	16035715	5	3	2	1	1	3 m	0	0	1	0	2	1	0

102	55	1	16037916	4	1	0	1	1	3 m	0	1	0	1,2	1	2	0
103	18	1	16117894	3	2	0	2	1	1 week	0	0	1	0	1	2	0
104	27	0	16118193	3	2	0	2	1	1 m	0	0	1	2	1	1	3
105	15	0	16094330	3	2	0	2	1	4-5m	0	0	1	1,2,3	1	2	0
106	69	1	15159214	4	2	0	2	1	3m	0	0	1	0	1	1	0
107	36	0	15026697	driver	1	1	1	1	2 weeks	0	0	0	1,2	1	1	0
108	19	1	16124789	3	2	0	1	1	3m	0	0	0	0	1	2	0
109	33	1	1616130	4	2	0	2	1	4 days	0	0	0	1,2	1	2	0
110	14	0	16126282	3	2	0	2	1	1 m	0	0	0	1,2	1	2	0
111	49	0	16128771	In company	2	2	2	1	1m	0	0	0	0	1	2	0
112	26	0	16124836	In company	2	2	1	1	1m	0	0	0	0	1	2	0
113	19	0	16127820	3	2	0	2	1	4m	0	0	1	1	1	2	4 (cow)
114	67	0	16030263	2	1	1	2	1	1m	0	0	0	0	1	2	0
115	40	0	15245847	2	1	1	1	1	2m	0	0	0	0	1	2	0

S.No	Site	Type	Ring lesion	Scaling	Discolouartion	Discharge	Blood stained	foul smell	Diagnosis	KOH	Culture	Organism
1	5,9	2	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
2	9	2,3	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
3	9	2	1	1	1	0			T. cruris	Positive	Negative	
4	5	2,3	1	1	0	0			T. corporis	Positive	Negative	
5	9	2	1	1	1	1	0	0	T. cruris	Positive	Positive	T.mentagrophyte
6	10	2	1	1	1	0			T. Pedis	Positive	Negative	
7	2	2	1	1	1	0			T. faciei+T. cruris	Positive	Positive	T.mentagrophyte
8	9	2,3	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
9	9	5,3	1	1	1	0			T. cruris	Positive	Positive	T.mentagrophyte
10	7,9	2	1	1	1	0			T. manuum+T. cruris	Positive	Positive	T.rubrum
11	9	2	1	1	1	1	0	0	T.corporis+ T. cruris	Positive	Negative	
12	5,9	2,3	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
13	4,9	2	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
14	5,8,9,10	2	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
15	2	2,3	1	1	1	0			T. faciei			
16	9	2,3	1	1	1	0			T. cruris	Positive	Negative	
17	6	5	1	1	0	1	0	0	T. corproris	Positive	Positive	T.rubrum
18	9	2,3	1	1	1	0			T. cruris			
19	5,9	2	1	1	1	0			T. cruris			
20	2,5	1	0	0	1	0			T. corporis	Positive	Negative	
21	2,5,9	5,3	1	1	1	0			T. corproris+ T.cruris +T.faciei	Positive	Positive	T.rubrum
22	9	5	1	1	1	0			T. corproris+TV			
23	9	5,3	1	1	1	0			T. cruris+ TV			
24	6	5	1	1	1	1	0	0	T. corporis	Positive	Positive	T.rubrum
25	9	5	1	1	1	0			T. cruris	Positive	Positive	T.rubrum

26	6	5	1	1	1	0			T. corprois			
27	9	2	1	1	1	0			T. cruris			
28	6	2	1	1	1	0			T. corprois			
29	7	2	1	1	1	0			T. manuum			
30	8,9,10	2	1	1	1	1	0	0	T.corporis+ T. cruris	Positive	Positive	T.mentagrohyte
31	7,9	2	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
32	9	2	1	1	1	0			T. cruris	Positive	Negative	
33	9	2	1	1	0	0			T. cruris	Positive	Positive	T.mentagrohyte
34	9	2	1	1	1	0			T. cruris			
35	10	2	1	1	0	0			T. pedis			
36	9	5	1	1	1	1	0	0	T. cruris			
37	11	2	1	1	1	0			T. corprois			
38	9	2,3	1	1	1	0			T.cruris	Positive	Positive	T.rubrum
39	9	5	1	1	1	1	0	0	T. cruris			
40	5	5	1	1	0	0			T. corporis	Positive	Negative	
41	3,5,9	5	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.mentagrophyte
42	3,4,8,9	2	1	1	1	1	0	0	T.corporis+ T. cruris	Positive	Negative	
43	5,8	5	1	1	0	0			T. corporis			
44	5,9	2	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
45	4,11	2	1	1	1	1	0	0	T.corporis+ T. cruris	Positive	Negative	
46	9	2	1	1	1	0			T.cruris+TV			
47	9	2	1	1	1	0			T cruris	Positive	Negative	
48	3,4,8	2	1	1	1	0			T. corporis			
49	3,8,9	2,3	1	1	1	0			T.corporis+ T. cruris			
50	9,11	2,3	1	1	1	0			T.corporis+ T. cruris			
51	9	2,3	1	1	1	0			T.corporis			

52	11	2,3	1	1	1	0			T.corporis			
53	3,4,5,8,9	2,3	1	1	1	0			T.corporis+ T. cruris			
54	3	2	1	1	1	0			T. corporis			
55	5,8,9,10	2	1	1	1	0			T.corporis+T.cruris+T.pedis(extensive)	Positive	Positive	T.rubrum
56	10	2	1	1	1	0			T. pedis			
57	6,9	5	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
58	3	5	1	1	1	0			T.corporis	Positive	Negative	
59	11	5	1	1	1	0			T. corporis	Positive	Negative	
60	9	2	1	1	1	0			T.cruris	Positive	Negative	
61	4,5	5	1	1	1	0			T.corproris	Positive	Positive	T.mentagrophyte
62	8,9	2	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.mentagrophyte
63	5, 7, 9	2	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
64	3,5	5,3	1	1	1	0			T.corproris	Positive	Positive	T.rubrum
65	11	5	1	1	1	0			T.C+mc			
66	5	5	1	1	1	0			T.corproris			
67	8,9	2,3	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
68	6,8	5	1	1	1	0			T.corproris			
69	8	2	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
70	3,5,9	2	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
71	3,4,9	5,2	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
72	3,9	2	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.mentagrophye
73	9	5,2	1	1	1	0			T. cruris			
74	3,9,11	2,3	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
75	6	5	1	1	1	0			T.corproris	Positive	Negative	
76	3,9	5	1	1	1	0			T.corproris	Positive	Positive	T.rubrum
77	3,6,9	2	1	1	1	0			T.corproris	Positive	Negative	

78	7,11	2	1	1	1	0			T.corproris + T.manuum			
79	9	5	1	1	1	0			T. cruris	Positive	Positive	T.mentagrophyte
80	9	5	1	1	1	0			Tinea cruris			
81	2,9	5,2	1	1	1	0			T. crucris+ T. faciei	Positive	Positive	T.rubrum
82	3,9	2	1	1	1	0			T.corporis+ T. cruris			
83	9	5	1	1	1	0			T.cruris	Positive	Negative	
84	3,5	2	1	1	1	0			T. corporis			
85	4,9	2	1	1	1	0			T.corporis+ T. cruris			
86	3,4,8	5,2	1	1	1	1	0	0	T. corporis			
87	3	2	1	1	1	0			T. corporis			
88	4,8	2	1	1	1	0			T. corporis	Positive	Negative	
89	10	2	1	1	1	0			T. pedis	Positive	Positive	T.rubrum
90	9	2	1	1	1	0			T. cruris			
91	9	5	1	1	1	0			T. cruris	Positive	Negative	
92	3	2	1	1	1	0			T.corproris	Positive	Negative	
93	2,5	5,2	1	1	1	0			T.corporis+ T.fascei	Positive	Negative	
94	2	2	1	1	0	0			T. faciei			
95	9	5	1	1	1	0			T. cruris	Positive	Negative	
96	3,9	5	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
97	10	5	1	1	1	0			T.corporis			
98	7	2,3	1	1	1	0			T.manuum	Positive	Negative	
99	3,4,6,9	5	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
100	4,5	5	1	1	1	0			T. corporis			
101	3,9,11	5	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.mentagrophyte
102	3,11	2	1	1	1	0			T.corproris	Positive	Negative	
103	9	5	1	1	1	0			T.cruris	Positive	Negative	

104	8	2,3	1	1	1	0			T. corporis	Positive	Negative	
105	9,10	5	1	1	1	0			T.corporis+ T. cruris	Positive	Positive	T.rubrum
106	4	2	1	1	1	0			T.corproris	Positive	Negative	
107	9,11	5	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
108	3,9	5	1	1	1	0			T.corporis+ T. cruris	Positive	Negative	
109	4	2	1	1	1	1	0	0	T.corproris	Positive	Negative	
110	2,11	2,3	1	1	1	0			T.corporis+ T.faciei	Positive	Positive	T.mentagrophyte
111	9,10	5	1	1	1	0			T. corporis	Positive	Negative	
112	9	5	1	1	1	1	0	0	T. cruris			
113	9	2,3	1	1	1	0			T.cruris	Positive	Negative	
114	2, 9	5,2	1	1	1	0			T.cruris+T.barbae			
115	8	5	1	1	1	1	0	0	T.corporis	positive	Positive	T.rubrum

MASTER CHART - KEY

1	Sex	0= male	1=female
2	Occupation	1= farmer	2=coolie
		3=student	4=house wife
		5= professional	6=business
3	Education	1=illetrate	2=undergraduate
		3=postgraduate	
4	Income	0=No income	1= in 100
		2= In 1000	
5	Area of living	1= rural	2=urban
6	Itching	0=no	1=yes
7	Pain	0=no	1=yes
8	Past history	0=no	1=yes
9	Family history	0= n0	1=yes
10	Sharing of fomites	1= towel	2=soap
		3=clothing	4=razor
		5=footwear	0=no
11	Bathing	1=everyday	2=every 2 days
		3=once in 3 days	
		4= once/week	
12	Source	1= common pool	
		2= well water	
13	Pets	1=bird	2=cat
		3=dog	4=others
		0=no	
14	Scaling	0=no	1=yes
15	Site	1=head	2=face
		3=axilla	4=inframammary
		5=abdomen	6=back
		7=upperlimb	8=waist area
		9=groin	10=lowerlimb
		11= buttocks	
16	Type of lesion	1= macule	2=patch
		3=papule	4=pustule
		5=others(plaque)	
17	Ring lesion	0=n0	1=yes
18	Scaling	0=no	1=yes
19	Discolouration	0=no	1=yes
20	Discharge	0=no	1=yes
21	Blood stained	0-no	1=yes
22	Foul smelling	0=no	1=yes